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LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., June 17, 1902.

SIR: I transmit herewith, for publication in the series of Professional Papers, the results of an estimate of the stand and character of the timber of Oregon.

Very respectfully, yours,

HENRY GANNETT,
Geographer.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

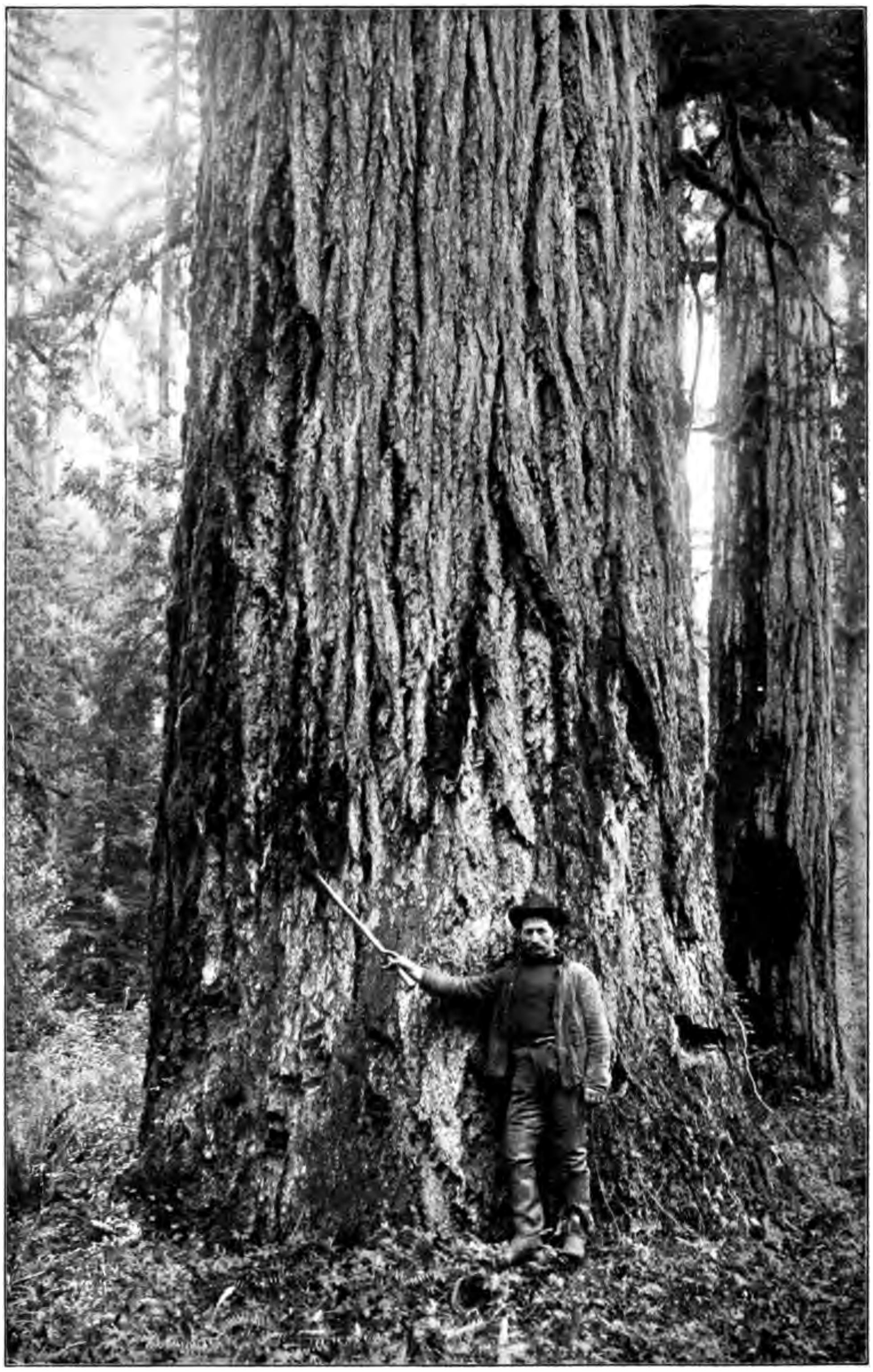
timber of merchantable size and quality; 40,228 square miles, or 43 per cent, are wooded, including in this the area of merchantable timber; 51,980 square miles, or 55 per cent, are at present open country, including the areas which were open before the settlement by whites and those which have been cleared by settlement; the remainder of the State consists of rocky and desert country in the Cascade Range and in the plateaus to the east.

The Coast Range presents an almost unbroken wooded region extending from the Columbia to the south boundary of the State. Toward the south boundary, however, the forests become more open, the southern slopes of the mountains being largely without timber, while, as a rule, the northern slopes are well forested. The great burned areas in the Coast Range are, in the main, well advanced toward restocking with timber. Succeeding this region on the east is a depression extending from Columbia River south to the Siskiyou Mountains, which consists in large part of open country. The northern portion of it consists of the Willamette Valley, beyond which to the southward succeed the valleys of Umpqua and Rogue rivers. The valley of the Willamette is a broad open expanse. How much of this valley was originally forested and has been cleared by man it is impossible at this time to say, but probably strips of considerable width on either side were formerly forested and have thus been cleared. The valleys of Umpqua and Rogue rivers contain much open land, in which are scattered bodies of timber.

The Cascade Range is heavily timbered from the west base to its crest and to a varying distance upon the eastern side. As in the Coast Range, the forest is less dense in the southern part of the State, and to a large extent is confined to the northern slopes. From the crest the forest extends eastward to varying distances, the distance being greatest in the southern part of the State, in Klamath and Lake counties, nearly all of the former county being covered by forests of yellow pine.

In the northeastern part of the State is a large, irregular, isolated body of timber covering the Blue and Wallowa mountains. These forests are open and light as compared with those in the western part of the State.

The crest of the Cascade Range is a natural dividing line between two very different portions of Oregon. West of this line the rainfall is heavy, and consequently the forests are, as a whole, dense, and in parts extremely luxuriant. East of that boundary the rainfall is light, the forests are comparatively scanty and open, and the stand of timber is small. The total area of that part of the State west of the crest of the range is 28,877 square miles, of which 15,089 square miles, or 52 per cent, are occupied by merchantable timber, and 7,102 square miles, or 24 per cent, are open country. As a contrast to this the eastern part of the State comprises 65,683 square miles, of which 13,754 square miles, or only 21 per cent, are timbered, and 44,878 square miles, or 68 per cent, are open country.



RED FIR IN COLUMBIA COUNTY, OREG.

The following table classifies the land west and east of the crest of the Cascade Range, and of the State as a whole:

Classification of lands in Oregon.

Class.	West of Cascades.	East of Cascades.	The State.
	Square miles.	*Square miles.*	*Square miles.*
Total area	28,877	65,683	94,560
Merchantable-timber area	15,089	13,754	28,843
Open country	7,102	44,878	51,980
Burned area	5,159	936	6,095
Cut area	799	280	1,079
Barren	359	1,983	2,352

The area given as cut over is necessarily only a small portion of that actually cleared, inasmuch as many hundreds of square miles were cleared long ago, are now under cultivation, and are here included in the open country.

FIRES.

The most startling feature shown by the land-classification map of this State is the extent of the burned areas, especially in the Coast Range and in the northern half of the Cascades. It must be understood that the areas represented here as burned are only those in which the destruction of timber was nearly or quite complete. Areas which have been burned over with only a partial destruction of the timber are not here represented. It will be noted that the burns are greatest and most frequent in the most moist and most heavily timbered parts of the State, and are smaller and fewer where the rainfall is less and where the timber is lighter. This is owing to the density and abundance of the undergrowth in the heavily forested regions, which feeds the fire and vastly increases its heat. In the comparatively sparsely timbered southern portions of the Coast Range and the Cascades and in the Blue Mountains, where the forests are largely or mainly of yellow pine in open growth, with very little litter or underbrush, destructive fires have been few and small, although throughout these regions there are few trees which are not marked by fire, without, however, doing them any serious damage.

The areas here represented as burned comprise altogether not less than 6,095 square miles, or 7 per cent of the area of the State. Since these burned areas are almost invariably taken from the area formerly timbered, their area may be compared with the timbered area. Out of a total area at one time timbered, not less than 18 per cent, therefore, has been destroyed by fire. Of the amount of the destruction of timber by this agency we may make some estimate, since it is roughly proportional to the amount of land over which the fires have run.

The present stand of timber in the western portion of the State being approximately 154,713 million feet, and the burned area being about one-third of the timbered area, the destruction of timber by fire in this part of the State has been approximately 51,000 million feet. Similarly it appears that in the eastern part of the State the destruction amounts to about 3,000 million feet, a total of 54,000 million feet in the State. This at $1 per 1,000 feet, the present average stumpage price, gives a total loss by fire of $54,000,000. This is a high price to pay for carelessness. The destruction has been even greater here than in Washington, where, as was estimated, 40,000 million feet have been destroyed in a similar manner.

Since this region, especially that portion of it west of the Cascades, where the great burns have occurred, is abundantly watered, and in all other respects extremely favorable for tree growth, all of these burns are in some stage of reforesting, and in most of them reforesting has gone forward rapidly and very favorably. Much of this burned country is now covered with a dense stand of young trees. The species following the fires are, in nearly all cases, similar to those destroyed. Fir follows fir, yellow pine follows yellow pine. There is traceable, however, in the southern part of the State, a tendency toward an extension of the territory of the yellow and sugar pines, with a corresponding reduction of the fir areas. East of the crest of the Cascades some areas formerly occupied by yellow pine have been restocked by lodgepole pine. As a rule, however, even east of the Cascades, the same species succeed, and in this region it is almost invariably yellow pine, since that is the prevailing tree.

In some cases, however, and especially in the largest burns, the work of reforestation has made little progress, owing probably to the difficulty of reseeding large burned areas. Since over many square miles all the trees were killed, the seeds of a new crop have had to come from outside the region, and hence the seeding process has been slow. Areas are reported which were burned twenty-five to fifty years ago on which there is no vegetation larger than brush and ferns, trees of any species not yet having obtained a foothold.

The earliest burns in the State of which we have record occurred in 1843. From that time down to the present fires of greater or less magnitude have occurred yearly, mainly in the late summer and early fall, when everything is driest. The greatest fires, however, seem to have occurred prior to and during the earliest settlements, between 1843 and 1870. Apparently the fires in recent years have not been as great or as disastrous as these earlier ones.

It is said that the burn between the forks of Coquille River, in the southwestern part of the State, occurred in 1843, and that after a lapse of twenty-five years, during which the region had made much progress in reforesting, a second fire occurred in the same region, in 1868. Since this latter fire the area has made great progress

A. THE GREAT NESTUCCA BURN.

B. THE GREAT YAQUINA BURN.

SPECIES OF TIMBER.

Not only do these two sections of the State differ widely in the extent of their forests, but they differ also in species.

Of the timber of Oregon, red fir constitutes not less than 66 per cent, a proportion somewhat larger than in Washington. Pine, including yellow and sugar pine, constitutes 18 per cent, a proportion much larger than in Washington. Spruce constitutes 5 per cent, the same as in Washington; hemlock 5 per cent and cedar only 2 per cent, being much less than in the more northern State.

In the western part of the State red fir forms 79 per cent of the forest, and the only other component of magnitude is the Sitka spruce, other species being of little relative importance. Yellow pine constitutes but 2 per cent. East of the crest, on the other hand, yellow pine forms 80 per cent of the forest, with red fir holding second rank.

Fir forms practically a pure forest on either side of Willamette and Rogue River valleys, including the eastern slopes of the Coast Range and the lower portion of the west slope of the Cascade Range. This species shares the western part of the Coast Range with the Sitka spruce and cedar, while in the higher parts of the Cascade Range other species of fir and cedar are found. The southern part of this region west of the Cascade crest contains much yellow and sugar pine.

Sitka spruce is found in a narrow strip hugging the Pacific coast, a region of continual fogs and moisture. It is here mingled with cedar, hemlock, and fir.

Yellow pine forms pure or nearly pure forest over all the timbered area east of the Cascade Range. It crosses the range near Crater Lake, and spreads over the Umpqua and Rogue River valleys and the Coast Range in a mixed forest with fir and sugar pine.

Sugar pine occupies an area in the southwestern part of the State on both sides of the Cascade Range, where it is mixed with yellow pine and fir.

Two small tracts of redwood, comprising about 400 acres, are found in the southwest corner of the State, in T. 39 S., R. 12 W., and T. 40 S., R. 13 W. These are the most northern occurrences of these species.

The following tables show the total stand and its classification by species in the State as a whole, and the same in the eastern and western parts of the State:

Composition of forest in Oregon.

Species.	West of Cascades.		East of Cascades.		Total.	
	Million feet B. M.	*Per cent.*	*Million feet B. M.*	*Per cent.*	*Million feet B. M.*	*Per cent.*
Red fir	136,543	79	4,762	11	141,305	66
Yellow pine	3,886	2	33,254	80	37,140	17
Sitka spruce	8,915	5			8,915	5
Red cedar	4,547	3			4,547	2
Hemlock	8,887	5	1,082	3	9,969	5
White cedar	2,652	2			2,652	1
Noble fir	2,355	1	454	1	2,809	1
Sugar pine	1,648	1	341	1	1,989	1
White fir	723	2	704	2	1,427	2
Tamarack			704	2	704	
White pine	287		175		462	
Incense cedar	208		53		261	
Engelmann spruce	29		89		118	
Lovely fir	1,100				1,100	
Total	171,780		41,618		213,398	

CLASSIFICATION OF LANDS AND STAND OF TIMBER, BY COUNTIES.

The following table summarizes the total stand of timber and the average stand per acre of timbered land in each county.

Total stand of timber and stand per acre in Oregon, by counties.

County.	Stand.	Average stand per acre.
	Million feet B. M.	*Feet B. M.*
Baker	3,084	8,100
Benton	1,839	12,600
Clackamas	8,516	25,200
Clatsop	16,736	37,400
Columbia	9,841	31,200
Coos	13,557	24,500
Crook	7,577	4,800
Curry	5,466	11,000
Douglas	21,156	13,200
Grant	2,370	2,800
Harney	336	1,300
Jackson	10,327	10,000
Josephine	3,616	6,000
Klamath	11,822	5,500
Lake	3,106	3,000

Total stand of timber and stand per acre in Oregon, by counties—Continued.

County.	Stand.	Average stand per acre.
	Million feet B. M.	*Feet B. M.*
Lane	34,006	17,900
Lincoln	6,881	30,300
Linn	9,433	12,300
Malheur	130	2,100
Marion	3,351	11,900
Morrow	147	1,435
Multnomah	1,915	29,300
Polk	4,454	22,900
Tillamook	16,861	39,500
Umatilla	257	4,800
Union	3,273	3,800
Wallowa	3,304	4,700
Wasco	5,988	17,600
Washington	2,628	16,200
Wheeler	359	800
Yamhill	1,062	16,400

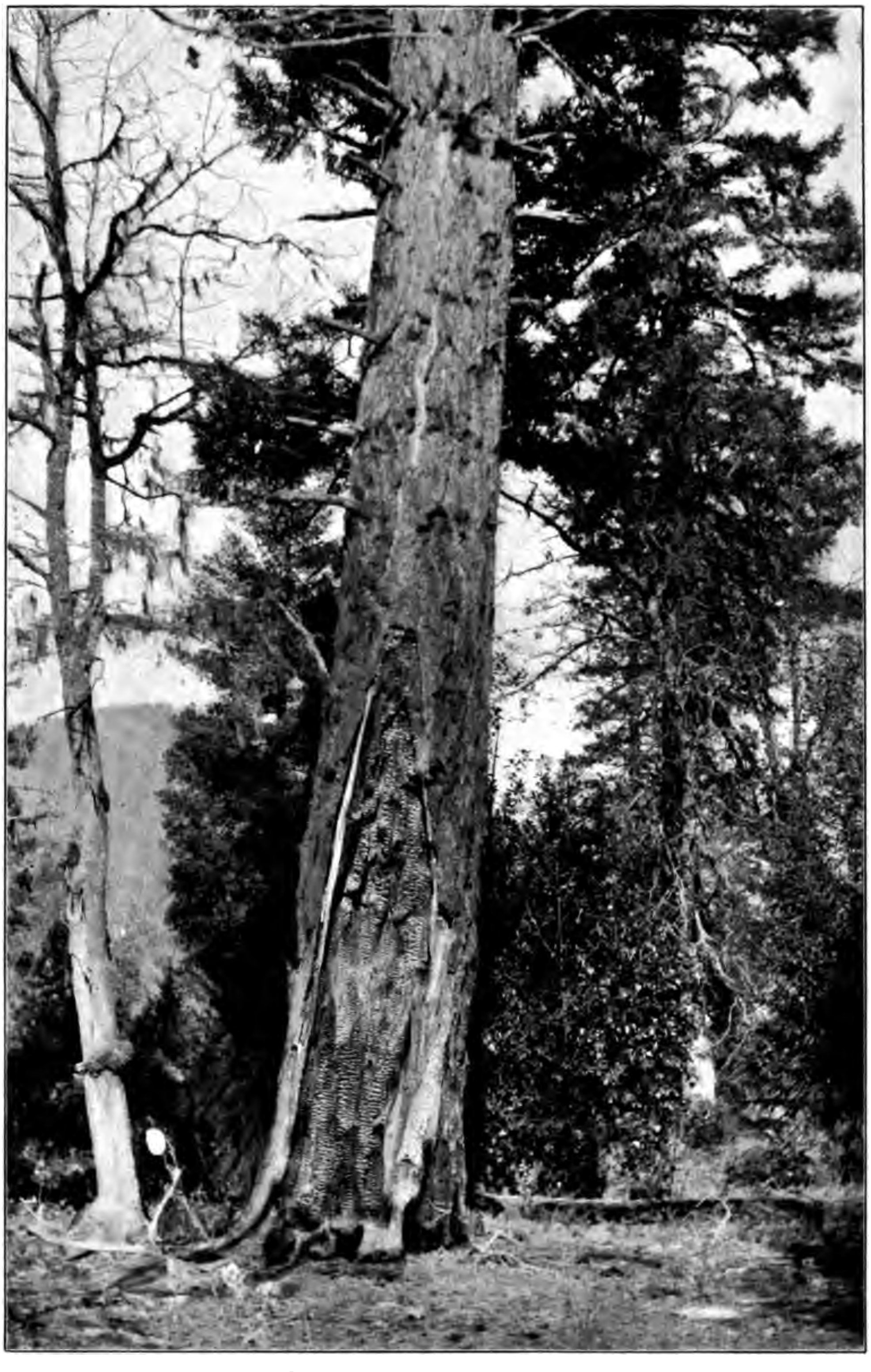
The heaviest average stand per county is in Tillamook, on the coast. Other coast counties show very heavy stands, particularly Clatsop and Lincoln. Generally speaking, the counties in the Coast Range have the heaviest stands in the State, with those on the west slope of the Cascade Range as second to them in stand. Compared with those farther south, the counties bordering on Columbia River have the heavier stands, as in Columbia and Multnomah.

BAKER COUNTY.

This county lies in the eastern part of the State. Most of its area is comprised in the valley of Powder River and the Snake, and is composed of level country and low hills. The western part forms the eastern slope of the Blue Mountains, which rise to altitudes of 9,000 feet. The slopes of this range contain some merchantable timber, in which considerable cutting has been done for the supply of mines and the building of Baker City, the county seat.

Classification of lands in Baker County.

	Square miles.
Total area	2,275
Merchantable-timber area	595
Woodland	96
Cut lands	120
Open country	1,400
Barren	64



RED FIR, SHOWING RESULT OF FOREST FIRE.

Amount and classification of timber in Baker County.

	Million feet B. M.
Yellow pine	2,960
Tamarack	62
Red fir	62
Total	3,084

Average stand of timber per acre of timbered land, 8,100 feet B. M.

BENTON COUNTY.

This county lies in the western part of the State, being comprised in part in the valley of Willamette River and in part in the Coast Range, of which it occupies a portion of the eastern slope. The eastern, valley part of the county is mainly open and occupied by farms, with timber in small patches scattered over it. The western, hill portion is in part covered with merchantable timber. Another portion of what was formerly covered with merchantable timber has been cut, and a third part has been burned, being included within the great Yaquina burn.

Classification of lands in Benton County.

	Square miles.
Total area	677
Merchantable-timber area	228
Cut area	119
Burned area	88
Open country	242

Amount and classification of timber in Benton County.

	Million feet B. M.
Red fir	1,728
Spruce	74
Cedar	37
Total	1,839

Average stand of timber per acre of timbered land, 12,600 feet B. M.

CLACKAMAS COUNTY.

This county is in the northwestern part of the State, the western portion extending down to the middle of the Willamette Valley, while its boundary on the east is the crest of the Cascade Range. The western, valley portion is open and is largely occupied by farms, with which are interspersed groves and patches of woodland. Much the larger part of the county, however, lies on the west slopes of the Cascade Range, and contains considerable areas of merchantable timber, together with several large burned areas; indeed, the burned areas comprise nearly one-half of the area of the county.

Classification of lands in Clackamas County.

	Square miles.
Total area	1,861
Merchantable-timber area	528
Cut area	38
Burned area	886
Open country	401
Barren	8

Amount and classification of timber in Clackamas County.

	Million feet B. M.
Red fir	7,986
Noble fir	265
Red cedar	177
White pine	88
Total	8,516

Average stand of timber per acre of timbered land, 25,200 feet B. M.

CLATSOP COUNTY.

This is the most northwestern county of the State, bordering on Columbia River at its mouth and the Pacific Ocean. Its area is comprised entirely in the Coast Range. The forests are extremely dense and heavy, and, compared with the area of the county, but little cutting has been done, and the burned areas, although numerous, are small and collectively amount to less than 5 per cent of the area of the county.

Classification of lands in Clatsop County.

	Square miles.
Total area	820
Merchantable-timber area	698
Cut area	32
Burned area	40
Open country	2
Barren	48

Amount and classification of timber in Clatsop County.

	Million feet B. M.
Red fir	10,543
Spruce	3,683
Hemlock	1,506
Cedar	1,004
Total	16,736

Average stand of timber per acre of timbered land, 37,400 feet B. M.

COLUMBIA COUNTY.

This county lies east of Clatsop, bordering on Columbia River on the north and east. It is a hilly county, comprising a portion of the Coast Range, and is largely covered with merchantable timber. Numerous small areas have been burned, amounting collectively to a little more than 10 per cent of its area, and some cutting has been done.

Classification of lands in Columbia County.

	Square miles.
Total area	677
Merchantable-timber area	493
Cut area	56
Burned area	80
Barren	48

Amount and classification of timber in Columbia County.

	Million feet B. M.
Red fir	8,561
Cedar	1,083
Hemlock	197
Total	9,841

Average stand of timber per acre of timbered land, 31,200 feet B. M.

COOS COUNTY.

This county borders on the Pacific Ocean, in the southwestern part of the State, and includes upon the east a considerable part of the Coast Range. Much of the western portion of the county is low and marshy, and contains many small open areas. Burns have in time past been frequent, and have destroyed the timber upon more than one-fourth of the area of the county. Most of them are of great age, having occurred more that fifty years ago, and the tracts are now in great part restocked with young timber. Some cutting has been done, especially in the neighborhood of Coos Bay.

Classification of lands in Coos County.

	Square miles.
Total area	1,578
Merchantable-timber area	866
Burned area	424
Open country	248
Barren	40

Amount and classification of timber in Coos County.

	Million feet B. M.
Red fir	10,168
White cedar	2,033
Spruce	1,356
Total	13,557

Average stand of timber per acre of timbered land, 24,500 feet B. M.

CROOK COUNTY.

This large county lies in the central part of the State, its western portion extending to the crest of the Cascade Range, whence it stretches far out into the plateau to the east. It contains a large body of timber and woodland upon the east slope of the range, and this body of timber stretches out onto the plateau far to the east of the mountains. Besides this main body of timber there are several others in the eastern part of the county. The timber consists almost exclusively of yellow pine.

Classification of lands in Crook County.

	Square miles.
Total area	7,756
Merchantable-timber area	2,466
Woodland	799
Burned area	216
Open country	4,020
Barren	255

Amount and classification of timber in Crook County.

	Million feet B. M.
Yellow pine	7,483
Red fir	94
Total	7,577

Average stand of timber per acre of timbered land 4,800 feet B. M.

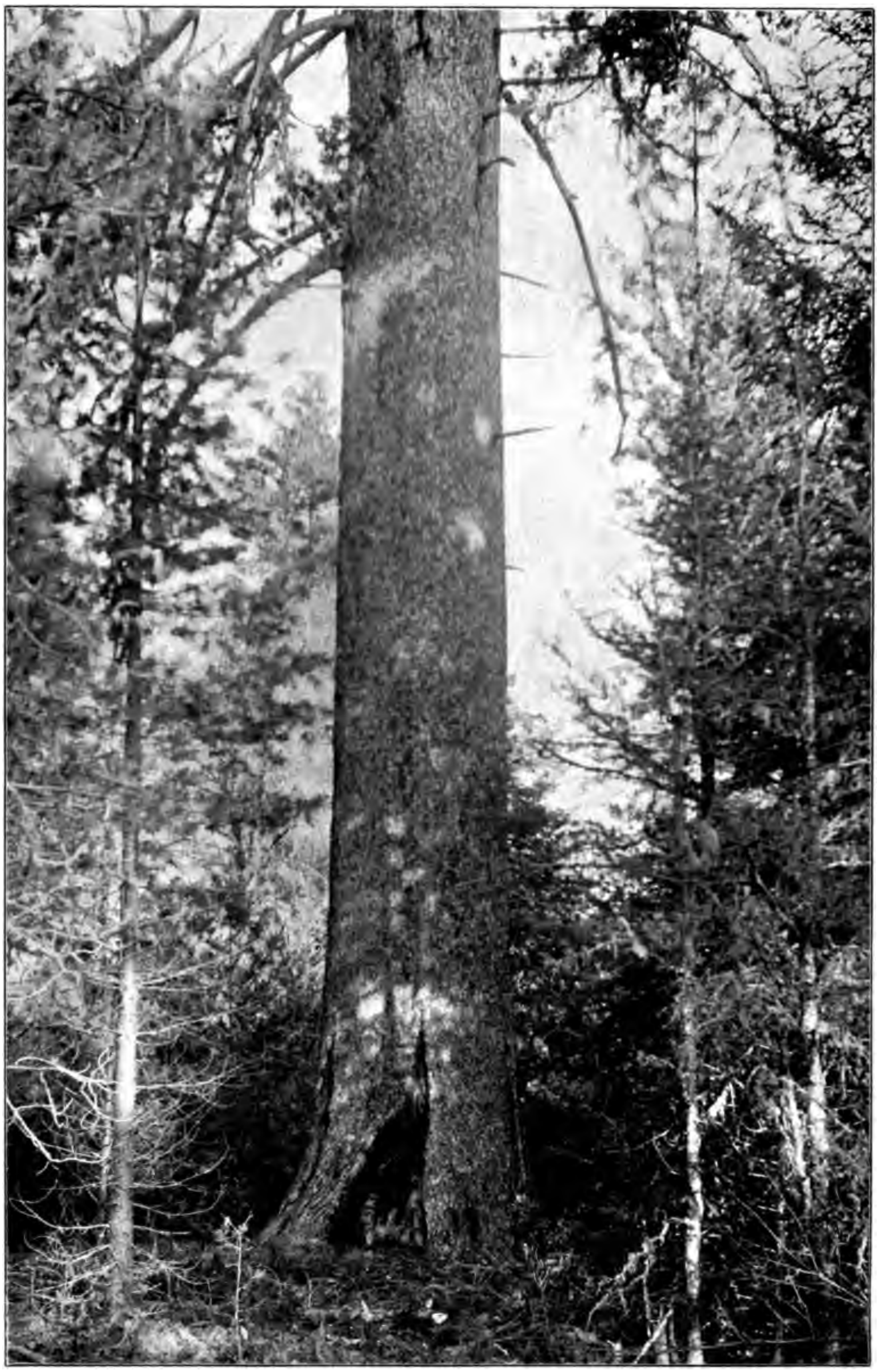
CURRY COUNTY.

This is the most southwestern county of the State, bordering upon the Pacific Ocean and the California line. Near the coast is a strip of open country, and in the eastern part of the county the timber becomes somewhat scattering, especially upon the south slopes of the mountains. There has been no cutting of any consequence in the county, but the northern part has been badly burned.

In the southwestern part of the county, in T. 39 S., R. 12 W., and T. 40 S., R. 13 W., there are small tracts, aggregating about 400 acres, of redwood, the sole representatives of this species in the State, and the most northern extension of the species.

Classification of lands in Curry County.

	Square miles.
Total area	1,454
Merchantable-timber area	782
Burned area	272
Open country	384
Barren	16



SUGAR PINE, SHOWING RESULT OF FOREST FIRE.

Amount and classification of timber in Curry County.

	Million feet B. M.
Red fir	4,810
White cedar	547
Sugar pine	109
Total	5,466

Average stand of timber per acre of timbered land, 11,000 feet B. M.

DOUGLAS COUNTY.

This large county stretches northwestward from the crest of the Cascades to the coast, including the valley of Umpqua River. It is heavily timbered in the east and west—that is, in the Cascade and Coast ranges—while the central portion is largely composed of open country, dotted with farms alternating with patches of timber. The eastern portion of the county, in the Cascade Range, contains several burns, but none of great magnitude; the western portion, near the Pacific coast, was in large part burned many years ago and is now covered with a young growth of timber.

Classification of lands in Douglas County.

	Square miles.
Total area	4,861
Merchantable-timber area	2,513
Woodland	341
Burned area	531
Cut area	20
Open country	1,428
Barren	28

Amount and classification of timber in Douglas County.

	Million feet B. M.
Red fir	17,485
Hemlock	3,014
Sugar pine	263
Yellow pine	263
Red cedar	131
Total	21,156

Average stand of timber per acre of timbered land, 13,200 feet B. M.

GILLIAM COUNTY.

This is one of the northern counties of the State, east of the Cascade Range, bordering on the north on Columbia River. The county has an area of 1,123 square miles. It contains no timber whatever.

GRANT COUNTY.

This county lies toward the eastern part of the State, adjoining Baker County on the east. It includes the western slopes of the Blue Mountains, with the long spurs running westward from them, and contains considerable timbered and wooded land, in very irregular form.

Classification of lands in Grant County.

	Square miles.
Total area	4,560
Merchantable-timber area	1,308
Woodland	749
Open country	2,419
Barren	84

Total stand of timber in this county is 2,370 million feet, all of which is yellow pine.

Average stand per acre of timbered land, 2,800 feet B. M.

HARNEY COUNTY.

This large county lies toward the southeastern part of the State. Its surface is mainly level or undulating, but is intersected by several ranges of mountains and hills, such as Steins Mountain, in the southwestern part. The only timber contained in the county is toward its northern edge, where a range of hills bears scattering pines.

Classification of lands in Harney County.

	Square miles.
Total area	9,986
Merchantable-timber area	400
Open country	9,586

Total stand in this county is 336 million feet B. M., all of which is yellow pine.

Average stand per acre of timbered land, 1,300 feet B. M.

JACKSON COUNTY.

This county is situated in the southwestern part of the State, bordering the California line on the south, and extending on the east to the crest of the Cascade Range. The western part of the county is largely open country, dotted with farms and with patches of timber, while the eastern part, in the Cascade Range, and the southern part, in the Siskiyou Mountains, are timbered, but not heavily, with a mixed growth of yellow and sugar pines, red fir, and other species. There are many burned areas in the western part of the county, but they do not cover a great area, but little more than 5 per cent of the area of the county having been included in destructive fires.

Classification of lands in Jackson County.

	Square miles.
Total area	2,721
Merchantable-timber area	1,682
Burned area	146
Open country	874
Barren	19

Amount and classification of timber in Jackson County.

	Million feet B. M.
Yellow pine	2,375
Sugar pine	516
White pine	116
Red fir	5,679
White fir	723
Noble fir	619
Incense cedar	63
Hemlock	207
Engelmann spruce	29
Total	10,327

Average stand of timber per acre of timbered land, 10,000 feet B. M.

JOSEPHINE COUNTY.

This county lies west of Jackson and extends on the south to the California line. Most of the area of the county is included in the Coast Range, and bears a scattered light growth of timber composed mainly of fir and yellow and sugar pine. A considerable part of this county has been cut over.

Classification of lands in Josephine County.

	Square miles.
Total area	1,684
Merchantable-timber area	930
Cut area	200
Open country	554

Amount and classification of timber in Josephine County.

	Million feet B. M.
Red fir	1,591
Yellow pine	1,012
Sugar pine	760
Incense cedar	145
White cedar	72
Noble fir	36
Total	3,616

Average stand of timber per acre of timbered land, 6,000 feet B. M.

KLAMATH COUNTY.

This county lies in the southern part of the State, bordering on the south upon California, its eastern boundary being the divide of the Cascade Range. The western part of the county is mountainous, while the central and eastern parts are plains and valleys, intersected by narrow mountain ranges or occupied by lakes. Much more than two-thirds of the area of this county is wooded, and more than one-half is covered with merchantable forests. The forests cover the eastern slope of the range, while in the rest of the county open and timbered tracts alternate irregularly.

Classification of lands in Klamath County.

	Square miles.
Total area	5,854
Merchantable-timber area	3,329
Woodland	837
Burned area	132
Open country	1,503
Barren	53

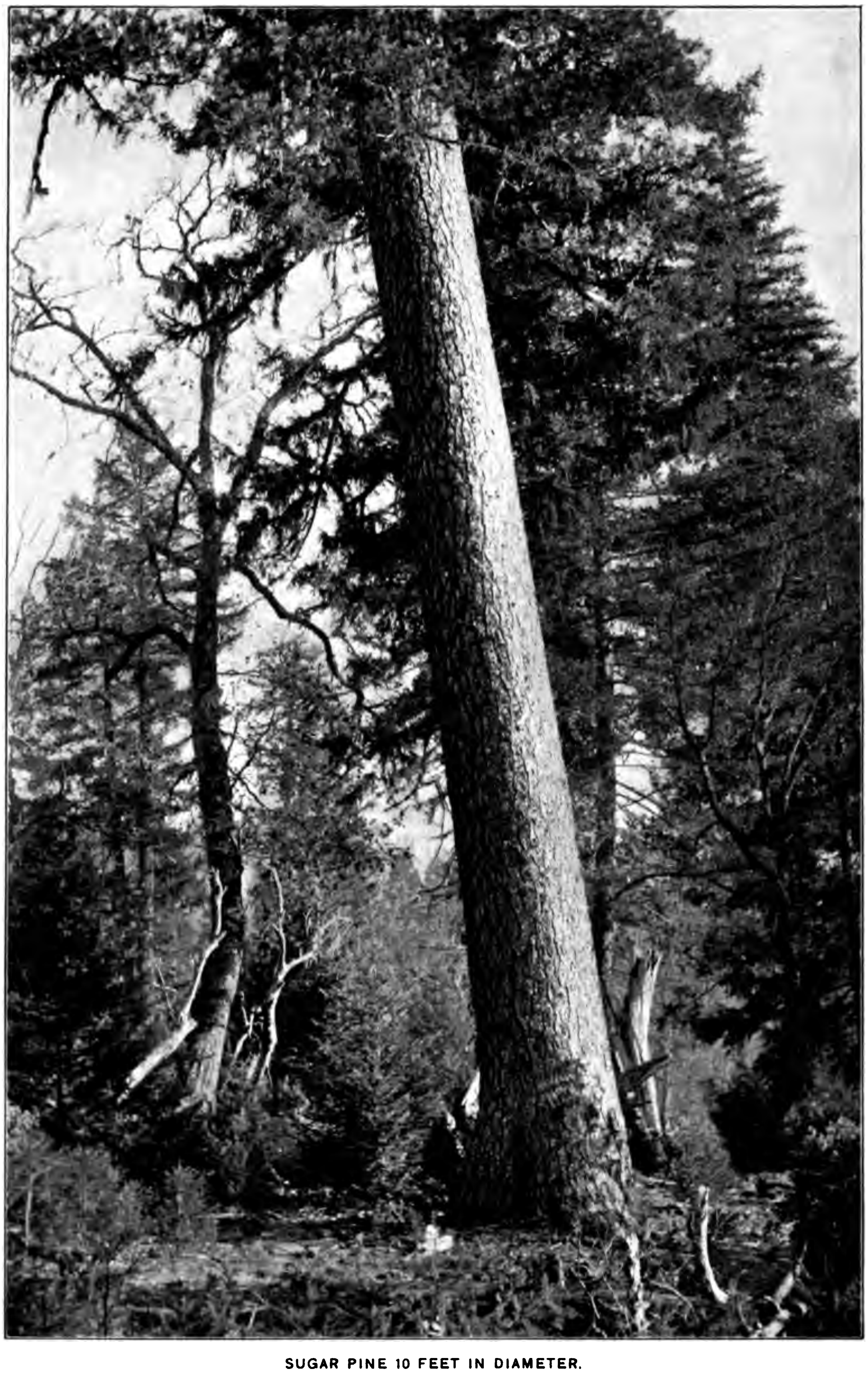
Amount and classification of timber in Klamath County.

	Million feet B. M.
Yellow pine	8,532
Sugar pine	341
White pine	85
Red fir	1,024
White fir	569
Noble fir	228
Incense cedar	53
Hemlock	901
Engelmann spruce	89
Total	11,822

Average stand of timber per acre of timbered land, 5,500 feet B. M.

LAKE COUNTY.

This county lies east of Klamath, bordering on California and Nevada on the south. The only timber in the county is found in its western portion, where it joins the great bodies which stretch over from Klamath County. Its surface is mainly a plateau, intersected by several narrow mountain ranges, and in the northern part by a great flow of lava, which has all the aspects of a desert.



SUGAR PINE 10 FEET IN DIAMETER.

Classification of lands in Lake County.

	Square miles.
Total area	7,834
Merchantable-timber area	1,624
Woodland	120
Open country	4,956
Barren	1,134

Total stand of timber is 3,106 million feet B. M., all of which is yellow pine.

Average stand of timber per acre of timbered land, 3,000 feet B. M.

LANE COUNTY.

This county stretches from the crest of the Cascade Range westward to the coast, in its central portion intersecting the open valley of Willamette River. This valley is largely occupied by farms, alternating with patches of timber. The eastern and western portions of the county are heavily forested, and especially the portion within the Cascade Range, where, although there are several burns of magnitude, there is a vast extent of heavy forest. In the Coast Range, the portion bordering upon the coast, with a breadth equivalent to three townships eastward, is included in one of the great coast burns.

Classification of lands in Lane County.

	Square miles.
Total area	4,380
Merchantable-timber area	2,956
Cut area	33
Burned area	801
Open country	531
Barren	59

Amount and classification of timber in Lane County.

	Million feet B. M.
Red fir	27,827
Red cedar	471
Yellow pine	236
Noble fir	636
Hemlock	3,736
Lovely fir	1,100
Total	34,006

Average stand of timber per acre of timbered land, 17,900 feet B. M.

LINCOLN COUNTY.

This county lies along the Pacific coast, toward the northern part of the State, stretching from the coast back into the Coast Range. Upon three-fifths of its area the timber has been destroyed by fire, mainly by the great Yaquina burn, most of the area of which is included within this county.

Classification of lands in Lincoln County.

	Square miles.
Total area	1,008
Merchantable-timber area	354
Burned area	598
Open country	17
Barren	39

Amount and classification of timber in Lincoln County.

	Million feet B. M.
Red fir	4,679
Spruce	1,927
Cedar	275
Total	6,881

Average stand of timber per acre of timbered land, 30,300 feet B. M.

LINN COUNTY.

This county stretches from the summit of the Cascade Range westward to Willamette River, the western part of it being included within the valley of that stream, and consisting of open farming country alternating with patches of timber. The eastern portion, comprising about two-thirds of the county, lies in the Cascade Range and is in the main heavily timbered, although several large burns have reduced the timbered area.

Classification of lands in Linn County.

	Square miles.
Total area	2,311
Merchantable-timber area	1,193
Burned area	345
Open country	767
Barren	6

Amount and classification of timber in Linn County.

	Million feet B. M.
Red fir	8,843
Noble fir	393
Red cedar	197
Total	9,433

Average stand of timber per acre of timbered land, 12,300 feet B. M.

MALHEUR COUNTY.

This county is in the southeast corner of the State. It is comprised entirely in a semidesert plateau region, and presents, in the main, a level surface, traversed here and there by narrow ranges. The only timber in the county is in its northwest corner, where a little stretches over from the Blue Mountains.

Classification of lands in Malheur County.

	Square miles.
Total area	9,784
Merchantable-timber area	96
Open country	9,688

Total stand of timber is 130 million feet B. M., all of which is yellow pine.

Average stand of timber per acre of timbered land, 2,100 feet B. M.

MARION COUNTY.

This county is situated toward the northwestern part of the State, and stretches from the crest of the Cascade Range westward to Willamette River. That portion of it lying within the valley of the Willamette is largely occupied by farms, and consists of open country alternating with patches of timber. The mountainous portion of the county has been badly burned, but still contains a considerable area of merchantable timber.

Classification of lands in Marion County.

	Square miles.
Total area	1,170
Merchantable-timber area	439
Burned area	236
Open country	491
Barren	4

Amount and classification of timber in Marion County.

	Million feet B. M.
Red fir	3,102
Noble fir	83
White pine	83
Red cedar	83
Total	3,351

Average stand of timber per acre of timbered land, 11,900 feet B. M.

MORROW COUNTY.

This is one of the northern counties of the State, bordering on the north on Columbia River. Its surface is mainly level or undulating, rising in the south into hills which may be regarded as westward spurs from the Blue Mountains. The only timber in the county is in these hills, in the southern part, and consists almost entirely of yellow pine in scattering stands.

Classification of lands in Morrow County.

	Square miles.
Total area	2,021
Merchantable-timber area	160
Woodland	98
Open country	1,763

Total stand of timber is 147 million feet B. M., all of which is yellow pine.

Average stand of timber per acre of timbered land, 1,435 feet B. M.

MULTNOMAH COUNTY.

This county lies in the western part of the State, west of the Cascade Range, and borders on Columbia River. Eastward it stretches far up the slopes of the range, but does not reach its summit. The timber has been cut from nearly one-half of this county, and the timbered area still remaining is nearly one-fourth of its total area.

Classification of lands in Multnomah County.

	Square miles.
Total area	429
Merchantable-timber area	102
Woodland	18
Cut area	207
Burned area	23
Open country	25
Barren	54

Amount and classification of timber in Multnomah County.

	Million feet B. M.
Red fir	1,686
Noble fir	154
Hemlock	58
Red cedar	17
Total	1,915

Average stand of timber per acre of timbered land, 29,300 feet B. M.

POLK COUNTY.

This county lies in the western part of the State, bordering on the east on Willamette River, and stretching westward into the Coast Range. The eastern half of the county lies in an open valley, and is largely occupied by farms, alternating with patches of timber, while the western half is quite heavily forested.

Classification of lands in Polk County.

	Square miles.
Total area	701
Merchantable-timber area	304
Cut area	3
Burned area	10
Open country	384

Amount and classification of timber in Polk County.

	Million feet B. M.
Red fir	4,276
Red cedar	178
Total	4,454

Average stand of timber per acre of timbered land, 22,900 feet B. M.

Amount and classification of timber in Umatilla County.

	Million feet B. M.
Yellow pine	252
Tamarack	5
Total	257

Average stand of timber per acre of timbered land, 4,800 feet B. M.

UNION COUNTY.

This county is situated in the northeastern part of the State, bordering Snake River on the east. The southern and western parts consist of open valley country, the valley of Powder River and of the Grande Ronde. The northeastern portion comprises the southern slopes of the Wallowa Mountains, rising 10,000 to 11,000 feet above the sea. These slopes are covered to altitudes of between 8,000 and 9,000 feet with an open pine forest.

Classification of lands in Union County.

	Square miles.
Total area	3,146
Merchantable-timber area	1,324
Woodland	292
Cut area	69
Burned area	95
Open country	1,302
Barren	64

Amount and classification of timber in Union County.

	Million feet B. M.
Yellow pine	2,749
Red fir	262
Tamarack	262
Total	3,273

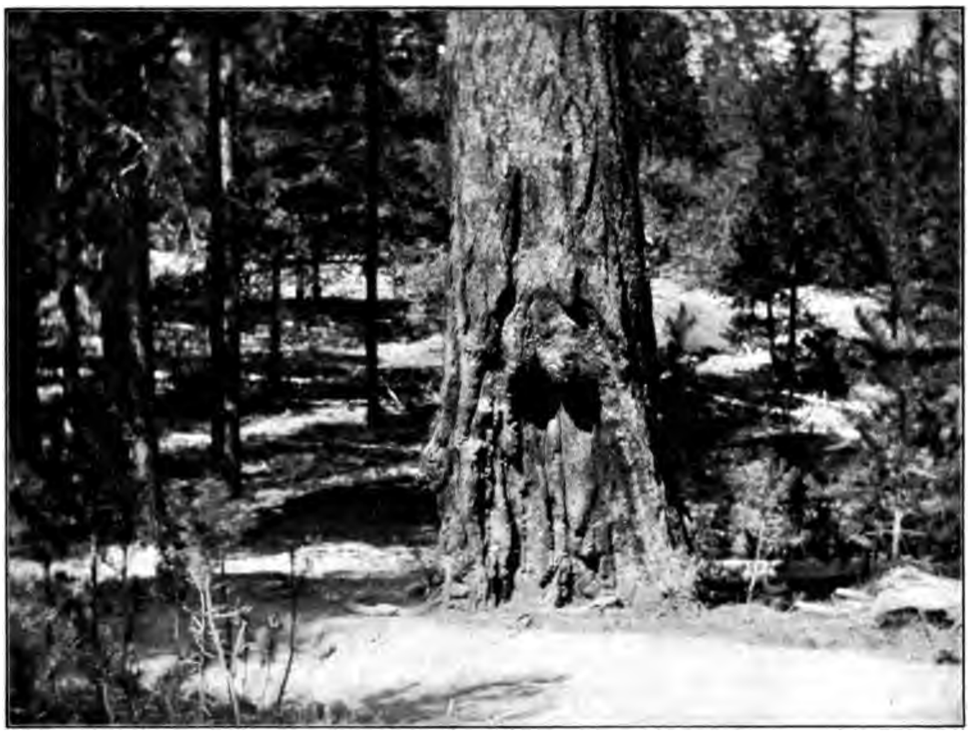
Average stand of timber per acre of timbered land, 3,800 feet B. M.

WALLOWA COUNTY.

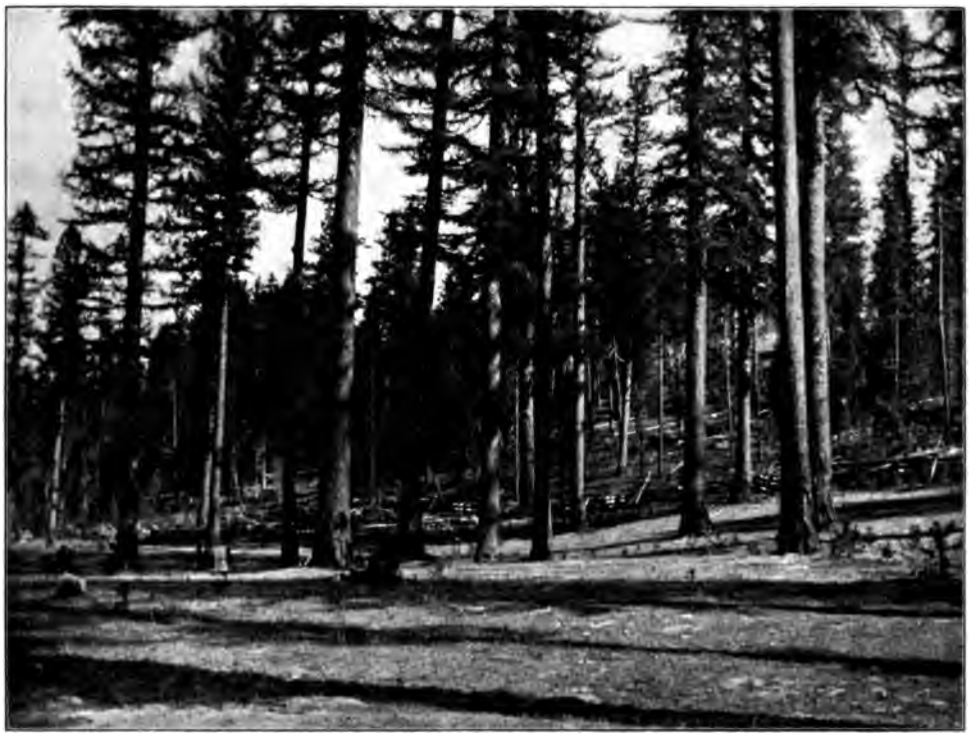
This is the northeastern county of the State, bordering on Snake River and the State of Washington. The northern and southern parts of this county are forested, the former consisting of the Blue Mountains and the latter of the northern slopes of the Wallowa Mountains. The timber consists mainly of yellow pine and is fairly heavy for that class of timber.

Classification of lands in Wallowa County.

	Square miles.
Total area	2,784
Merchantable-timber area	1,093
Burned area	57
Open country	1,464
Barren	170



A. YELLOW PINE, BLUE MOUNTAINS, SHOWING RESULT OF BURN.



B. TAMARACK GROVE, BLUE MOUNTAINS.

Amount and classification of timber in Wallowa County.

	Million feet B. M.
Yellow pine	2,544
Red fir	430
Tamarack	330
Total	3,304

Average stand of timber per acre of timbered land, 4,700 feet B. M.

WASCO COUNTY.

This is a northern county, bordering on the north on Columbia River, while its western limit is the summit of the Cascade Range. The eastern part of this county, comprising much the larger portion, is open, consisting of the valley of Deschutes River and the slopes leading down to it. The western portion of the county, lying in the Cascade Range, is mountainous and is heavily forested, excepting for one large burn, which includes nearly one-seventh of the entire area of the county.

Classification of lands in Wasco County.

	Square miles.
Total area	2,962
Merchantable-timber area	531
Woodland	295
Cut area	8
Burned area	395
Open country	1,629
Barren	104

Amount and classification of timber in Wasco County.

	Million feet B. M.
Red fir	2,890
Yellow pine	2,286
Noble fir	226
Hemlock	181
Cedar	135
White fir	90
White pine	90
Silver fir	45
Tamarack	45
Total	5,988

Average stand of timber per acre of timbered land, 17,600 feet B. M.

WASHINGTON COUNTY.

This county lies in the northwestern part of the State, bordering on the east upon Columbia River and stretching westward into the Coast Range. Most of the area of the county consists of open country, occupied by farms and small patches of timber. The only merchantable timber is in the northwestern part, and covers a relatively small area.

Classification of lands in Washington County.

	Square miles.
Total area	715
Merchantable-timber area	253
Cut area	63
Burned area	68
Open country	331

Amount and classification of timber in Washington County.

	Million feet B. M.
Red fir	2,575
Red cedar	53
Total	2,628

Average stand of timber per acre of timbered land, 16,200 feet B. M.

WHEELER COUNTY.

This is a new county, a little north of the center of the State. Its area consists largely of open country, the valleys of John Day River and its branches, but it is intersected by east and west ranges of hills, which may be regarded as westward spurs from the Blue Mountains, and which contain a scattering growth of yellow pine.

Classification of lands in Wheeler County.

	Square miles.
Area of county	1,746
Merchantable-timber area	744
Woodland	88
Open country	914

Total stand of timber is 359 million feet B. M., all of which is yellow pine.

Average stand of timber per acre of timbered land, 800 feet B. M.

YAMHILL COUNTY.

This county lies in the northwestern part of the State, bordering on the east upon Willamette River and stretching westward into the Coast Range. The eastern part of the county is open and is mainly occupied by farms and patches of timber, while the western portion, which otherwise would be heavily forested, is almost entirely included within the area of the great Nestucca burn. The area of merchantable timber in this county is, in consequence, very small.

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DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

THE
FORESTS OF WASHINGTON

A REVISION OF ESTIMATES

BY

HENRY GANNETT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1902

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., June 17, 1902.

SIR: I transmit herewith, for publication in the series of Professional Papers, a revision of the estimates of the standing timber and its distribution in the State of Washington.

Very respectfully, yours,
HENRY GANNETT,
Geographer.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

THE FORESTS OF WASHINGTON.
(A REVISION OF ESTIMATES.)

By HENRY GANNETT.

With the exception of the redwood forests of California the forests of western Washington are among the densest, heaviest, and most continuous in the United States. Except for a few prairie openings, and except where removed by fire and the ax, they cover the country as a thick mantle from a line high up on the Cascade Range westward to the shores of the Pacific. In all this region only the Olympics rear a few summits above the forests. Not only are the forests dense overhead, but the undergrowth is dense and tangled beneath. The trees are high, reaching 12 to 15 feet in diameter and 250 feet in height, with clear trunks for 100 or more feet. The timber is mainly red fir (*Pseudotsuga taxifolia*) mingled with spruce, hemlock, and cedar.

SOURCES OF INFORMATION.

Since the publication, in the Twentieth Annual Report, of the land-classification map of the State of Washington and the statistics of its standing timber, examinations have been made, somewhat in detail, of the mountain regions of the State, including the Olympic and Mount Rainier forest reserves. The first of these comprises the Olympic Mountains and the country westward, and the second a considerable part of the Cascade Range. Besides this, an examination has been made during the last season of the region in the Cascade Range lying between the northern limit of the Mount Rainier Forest Reserve and National Park on the south and the southern limit of the Washington Reserve on the north.

These examinations have resulted in increasing greatly the estimated stand of timber in the State above the figures published in the Twentieth Annual Report. The additions consist in part of large tracts of heavy stand of species now in use by lumbermen, including red fir, cedar, spruce, and hemlock, and in part of species which are known to be of value although not at present utilized, such, for instance, as the lovely fir.

These mountain regions are not regarded by the lumbermen of to-day as containing merchantable timber, largely because of the inaccessibility of the forests. The Washington lumberman is skimming the cream. He is taking only the best and heaviest of the timber and that which is most accessible, and, from his point of view, timber within the mountains, being difficult to log, is not regarded as having any present value. That it will come into the market eventually, when the more accessible timber is exhausted, it is of course unnecessary to say, and on this account it should properly be included in a statement of the timber assets of the State. The inclusion of these bodies of timber raises the total stand of the State from 114,778,000 M feet B. M. to 195,687,966 M feet B. M.

Besides the information derived from the examinations above noted, the sources of information concerning the lands and forests of Washington are as follows:

The Northern Pacific Railway Company, which has made most elaborate cruisings of that part of its land grant situated west of the Cascade Range, has, with great liberality, through its general manager, Mr. Thomas Cooper, furnished an abstract of all the information in its possession regarding timber lands, including not only the statistics of standing timber, but maps showing the areas at present forested, those naturally unforested, those which have been cut over, and those which have been burned. These statistics have been compiled and the maps have been prepared by Messrs. John M. Rankine and George H. Plummer, of the Northern Pacific Railway office. The commissioner of the State land office has furnished abstracts of all cruisings made for the selection of lands for the State. Besides the above, several lumber companies and owners of timber land have placed their information at the disposal of this office.

The collection of data and preparation of estimates for the counties east of the crest of the Cascade Range has been done by Mr. Fred G. Plummer, who devoted the winter months of 1898–99 to this work.

Altogether, cruisings of more than 2,000,000 acres have been collected. These are scattered widely over the State and represent the stand of timber under all the different conditions of rainfall, temperature, soil, slope exposure, relief, and altitude.

The other factor necessary for obtaining the total stand of timber, the area of merchantable timber, has been obtained from the same sources in the greatest detail, and with this the areas which have been logged and which have been burned in recent years.

In connection with data regarding the stand of timber, its distribution as to species has been obtained, the classification being that recognized by lumbermen.

STAND OF TIMBER.

From these data the total amount of timber in the State, under the Washington lumbering practice, is estimated at 195,688 million feet B. M. Of this amount nearly nine-tenths, or 175,120 million feet, are west of the crest of the Cascade Range. The remainder, 20,568 million feet, is upon its eastern slope and in the northern and eastern portions of the State.

The State of Washington is naturally divided into two parts, which differ from each other widely in respect to timber growth. The line of division is the crest of the Cascade Range, running from the north to the south line of the State. West of it the country is heavily forested, or was before lumbering operations commenced. In this part of the State the areas naturally devoid of timber are few and small and altogether trifling in proportion to the total area. East of it the land is mainly without timber, and where timber exists it is sparse and its quality is inferior.

Moreover, there is a great difference in the species. West of the Cascade Range the prevailing species, which forms nearly one-half of the entire forest, is red fir. This and cedar, hemlock, spruce, and lovely fir (*Abies amabilis*) compose the forest. Fir is found in almost all parts of this region, and throughout the Sound Valley little of any other species is found, the forests being almost pure fir. East of the Cascade Range the forest consists mainly of pine, principally yellow pine, though in the northeast corner of the State a little white pine is intermingled. Red fir is found scattered through the pine forests in considerable proportion, and in the northeastern part of the State larch is abundant. Small proportions of hemlock and cedar are also found, and a trifling amount of spruce and oak.

The following table gives the stand of timber of the species recognized by the lumbermen, in thousands of feet B. M., with the percentage which each bears to the total amount:

Amount and percentage of species of timber in Washington.

Species.	M feet B. M.	Per cent.
Red fir	90, 592, 926	46
Spruce	8, 220, 723	4
Cedar	22, 646, 071	12
Hemlock	41, 571, 330	21
Lovely fir	8, 787, 500	5
Larch	4, 776, 034	2
Yellow pine	13, 082, 280	7
White fir	1, 231, 299	1
Other species	4, 779, 803	2
Total	195, 687, 966	....

Dividing the State into the two parts above given, the following tables show the stand of timber in each, with the amount and percentage of the prevailing species:

Standing timber in Washington.

COUNTIES WEST OF CASCADE RANGE.

	M feet B. M.
Total stand	175, 120, 112
Fir	86, 881, 834
Per cent of fir	49

COUNTIES EAST OF CASCADE RANGE.

	M feet B. M.
Total stand	20, 567, 854
Yellow pine	12, 851, 435
Per cent of yellow pine	61

The following table gives the amount of merchantable timber in each county, classified by species, in thousands of feet B. M., as at present estimated by lumbermen. If it were cut under the practice which prevails at present, these figures represent a close approximation to the amount which would be realized. There is no question, however, that, as in the case of the eastern white pine, a much larger amount will ultimately be realized, for several reasons:

First, the standard will certainly be lowered, so that instead of utilizing only one-third of the tree two-thirds may be used, and many small trees now destroyed by fire in the culled areas will be cut; second, species not now used may come into the market; third, areas now considered inaccessible will serve as sources of supply; fourth, the new growth on cut and burned areas will reach merchantable size long before the old growth is exhausted.

Summary of standing timber in Washington, by counties.

County.	Total stand.	Average stand per acre.	Red fir.	Spruce.	Cedar.
	M feet B. M.	*Feet B. M.*	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*
Adams	....	....	....	....	....
Asotin	79, 400	1, 200	15, 880	....	....
Chehalis	27, 632, 828	25, 000	10, 957, 668	3, 165, 557	4, 759, 920
Chelan	3, 095, 430	1, 810	377, 443	....	47, 070
Clallam	25, 742, 775	29, 300	6, 482, 650	2, 393, 185	2, 537, 620
Clarke	711, 552	9, 300	697, 092	....	14, 460
Columbia	182, 500	1, 700	36, 500	9, 125	....
Cowlitz	7, 492, 647	17, 800	5, 683, 311	1, 089	786, 691
Douglas	31, 000	1, 000	7, 750	....	....
Ferry	1, 666, 500	1, 200	333, 300	....	....
Franklin	....	....	....	....	....
Garfield	149, 700	2, 000	29, 940	7, 485	....
Island	430, 000	....	250, 000	....	180, 000
Jefferson	20, 691, 355	26, 700	3, 033, 175	843, 250	2, 712, 790

Summary of standing timber in Washington, by counties—Continued.

County.	Total stand.	Average stand per acre.	Red fir.	Spruce.	Cedar.
	M feet B. M.	*Feet B. M.*	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*
King	11,857,431	14,300	6,306,494	348,103	1,555,209
Kitsap	1,140,900	9,000	1,140,900	....	....
Kittitas	3,171,312	5,260	546,556	....	131,000
Klickitat	743,000	1,400	336,300	....	....
Lewis	11,378,162	12,800	8,848,113	....	1,137,426
Lincoln	12,000	300	1,800	....	....
Mason	7,029,429	15,000	4,953,121	8,492	437,778
Okanogan	3,831,260	1,340	533,100	....	....
Pacific	7,813,067	16,300	5,498,224	814,953	713,238
Pierce	10,868,440	15,700	6,798,950	200,871	1,286,573
San Juan	....	....	....	....	....
Skagit	11,098,111	11,000	6,297,350	184,096	2,716,326
Skamania	11,870,815	15,300	6,117,212	....	455,115
Snohomish	10,892,195	13,500	7,356,337	42,955	2,050,630
Spokane	716,000	2,100	32,680	....	29,560
Stevens	2,701,680	1,100	297,185	....	27,017
Thurston	2,787,343	10,100	2,608,125	462	108,949
Wahkiakum	2,974,107	27,000	1,947,150	182,520	301,757
Wallawalla	5,500	260	1,625	....	....
Whatcom	2,708,955	3,000	1,905,962	18,580	596,342
Whitman	35,000	3,000	....	....	....
Yakima	4,147,572	3,620	1,261,033	....	60,600
Total	195,687,966	9,355	90,592,926	8,220,723	22,646,071

County.	Hemlock.	Lovely fir.	Larch.	Yellow pine.	White fir.	Other species.
	M feet B. M.	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*
Adams	....	....	....	....	....	....
Asotin	....	....	7,940	47,640	7,940	....
Chehalis	6,649,683	....	2,100,000	....	....	....
Chelan	....	....	78,450	2,440,067	31,380	121,020
Clallam	11,179,820	3,149,500	....	....	....	....
Clarke	....	....	....	....	....	....
Columbia	....	....	18,250	109,500	9,125	....
Cowlitz	953,430	....	68,126	....	....	....
Douglas	....	....	....	23,250	....	....
Ferry	....	....	333,300	999,900	....	....
Franklin	....	....	....	....	....	....
Garfield	....	....	14,970	89,820	7,485	....
Island	....	....	....	....	....	....
Jefferson	8,920,140	5,182,000	....	....	....	....
King	2,712,971	....	....	....	75,233	859,421

Summary of standing timber in Washington, by counties—Continued.

County.	Hemlock.	Lovely fir.	Larch.	Yellow pine.	White fir.	Other species.
	M feet B. M.	*Feet B. M.*	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*	*M feet B. M.*
Kitsap						
Kittitas	265,911		150,645	1,349,200	520,000	208,000
Klickitat	71,400		10,500	321,100		3,700
Lewis	929,755		1,406		158,941	302,521
Lincoln				10,200		
Mason	1,174,038	456,000				
Okanogan			533,100	2,765,060		
Pacific	786,652					
Pierce	2,099,780				61,565	420,701
San Juan						
Skagit	1,900,339					
Skamania	1,948,042		551,990	230,845	295,207	2,272,404
Snohomish	1,055,737				64,423	322,113
Spokane			121,360	532,400		
Stevens			351,218	2,026,260		
Thurston	69,807					
Wahkiakum	542,680					
Wallawalla			1,625	2,250		
Whatcom	188,071					
Whitman				35,000		
Yakima	123,074		433,154	2,099,788		269,923
Total	41,571,330	8,787,500	4,776,034	13,082,280	1,231,299	4,779,803

The stand is heaviest in Clallam County, in the northern part of the Olympic Peninsula. The next heaviest is in Wahkiakum, in the southwest, near Columbia River. In western Washington the average stand is 16,000 feet; in eastern Washington it is but 1,800 feet B. M.

The entire area of Washington is 66,880 square miles. Of this, 34,245 square miles, or 51 per cent of its area, are covered with merchantable timber.

CLASSIFICATION OF LANDS.

The entire area of the nineteen counties of western Washington is 24,552 square miles. Of this area but 16,554 square miles, or two-thirds, are regarded as containing merchantable timber. Besides this, an area of 2,771 square miles has already been logged; a much greater area, 4,069 square miles, of merchantable timber has been burned. In other words, out of an area of 23,394 square miles formerly covered with merchantable timber, 12 per cent has been cut, 17 per cent has been destroyed

The following table presents the classification of lands by counties:

Classification of lands in Washington by counties.

County.	Timbered area.	Timberless area.	Cut area.	Burned area.	Rocky area.	Mountain meadows.
	Square miles.	*Square miles.*	*Square miles.*	*Square miles.*	*Square miles.*	*Square miles.*
Adams	....	1,696	....	....	....	....
Asotin	105	520	6	....	....	....
Chehalis	1,714	....	140	60	42	12
Chelan	2,665	282	26	97	....	....
Clallam	1,370	7	113	236	33	48
Clarke	119	....	20	498	9	....
Columbia	164	530	182	....	....	....
Cowlitz	646	....	82	385	32	....
Douglas	49	4,713	6	....	....	....
Ferry	2,270	38	....	5	....	....
Franklin	....	1,251	....	....	....	....
Garfield	128	527	70	....	....	....
Island	....	....	238	....	....	....
Jefferson	1,211	....	81	158	128	187
King	1,289	8	361	393	....	....
Kitsap	210	....	175	22	....	....
Kittitas	941	1,261	94	118	....	....
Klickitat	825	1,197	26	31	....	....
Lewis	1,396	45	71	813	11	....
Lincoln	63	2,036	200	....	....	....
Mason	729	....	199	31	20	14
Okanogan	4,468	850	....	....	....	....
Pacific	764	40	56	65	....	....
Pierce	1,079	159	200	76	40	....
San Juan	....	....	187	....	....	....
Skagit	1,576	90	196	12	....	....
Skamania	1,209	44	31	459	....	....
Snohomish	1,252	28	252	119	....	....
Spokane	530	654	585	8	....	....
Stevens	3,643	120	23	159	....	....
Thurston	430	106	161	66	....	....
Wahkiakum	173	22	38	40	....	....
Wallawalla	33	1,230	14	....	....	....
Whatcom	1,387	33	170	636	....	....
Whitman	19	1,977	109	....	....	....
Yakima	1,788	3,738	117	139	2	....
Total	34,245	23,202	4,229	4,626	317	261

ADAMS COUNTY.

This county lies in the southeastern part of the State. Its surface consists of a broadly undulating plateau of basalt, containing few stream courses, but many coulees.

The county contains no timber whatever, except strips of willow, alder, and aspen along the few streams.

ASOTIN COUNTY.

This is the southeasternmost county of the State. It consists mainly of the undulating, timberless, basalt plain of Snake River, but into its western edge extends the end of a spur from Blue Mountains, which bears some timber.

Classification of lands in Asotin County.

	Square miles.
Total area	631
Merchantable-timber area	105
Timberless area	520
Cut area	6

Estimate of timber in Asotin County.

	M feet B. M.
Pine	47,640
Red fir	15,880
Larch	7,940
White fir	7,940
Total	79,400

Average stand per acre of timbered land in feet B. M., 1,200.

Besides the above there is on the cut area a small amount, estimated at 2,000,000 feet, still standing, which, added to the above estimate, gives a total of 81,400 M feet B. M. for the county.

CHEHALIS COUNTY.

This county borders upon the Pacific Ocean, and on the north extends far up into the Olympic Mountains. The northern portion is high and rugged, and in other portions there are numerous small prairie tracts. Aside from these areas the county was originally heavily forested, mainly with fir in the interior and with spruce and cedar upon the coast. There have been few fires in this county, and the burned area is trifling. Lumbering has, however, been carried on extensively upon the streams flowing into Grays Harbor, and especially upon Chehalis River, nearly one-tenth of the timbered area of the county having been denuded of its forests.

Classification of lands in Chehalis County.

	Square miles.
Total area	1,968
Merchantable-timber area	1,714
Barren and rocky	42
Burned area	60
Mountain meadows	12
Cut area	140

Estimate of timber in Chehalis County.

	M feet B. M.
Red fir	10,957,668
Spruce	3,165,557
Cedar	4,759,920
Hemlock	6,649,683
Lovely fir	2,100,000
Total	27,632,828

Average stand per acre of timbered land in feet B. M., 25,000.

CHELAN COUNTY.

This county has been recently formed from parts of Kittitas and Okanogan counties. It lies upon the slope of the Cascade Range, extending eastward to Columbia River. Much the larger part of its area is mountainous, and is sparsely timbered, mainly with yellow pine.

Classification of lands in Chelan County.

	Square miles.
Total area	3,070
Merchantable-timber area	2,665
Timberless area	282
Burned area	97
Cut area	26

Estimate of timber in Chelan County.

	M feet B. M.
Yellow pine	2,440,067
Red fir	377,443
Tamarack	78,450
Cedar	47,070
Lodgepole pine	18,497
White fir	31,380
Other species	102,523
Total	3,095,430

Average stand per acre of timbered land in feet B. M., 1,810.

CLALLAM COUNTY.

This county occupies the northern part of the Olympic Peninsula. The southern portion of the county comprises a part of the Olympic Mountains. The remainder of the area was heavily forested, but the ax has made inroads into the forests along the shores of Puget Sound as far west as Crescent Bay, and fires have extended inland from these cuttings to the mountains, destroying considerable areas of timber. The western part of the county is still an unbroken forest.

The forests of this county are remarkable in the fact that they contain a large proportion of hemlock, the amount of this tree being much greater than that of the red fir.

Classification of lands in Clallam County.

	Square miles.
Total area	1,807
Merchantable-timber area	1,370
Rocky and barren	33
Burned area	236
Mountain meadows	48
Cut area	113
Prairie	7

Estimate of timber in Clallam County.

	M feet B. M.
Red fir	6,482,650
Spruce	2,393,185
Cedar	2,537,620
Hemlock	11,179,820
Lovely fir	3,149,500
Total	25,742,775

Average stand per acre of timbered land in feet B. M., 29,300.

CLARKE COUNTY.

This county lies in the southwestern part of the State, bordering on the south and west on Columbia River. Originally it was entirely covered with heavy forests, with the exception of a few small prairie tracts.

But little timber has been cut in the county, lumbering being principally confined to the line of the Portland, Vancouver and Yakima Railroad, and, on the other hand, the timber in more than two-thirds of the county has been destroyed by fire, the burned areas lying principally in the southern and western parts, leaving large bodies of forest in the eastern part.

The forest consists almost exclusively of fir, there being very little cedar and hemlock, and no spruce whatever.

Classification of lands in Clarke County.

	Square miles.
Total area	646
Merchantable-timber area	119
Barren and rocky	9
Burned area	498
Cut area	20

Estimate of timber in Clarke County.

	M feet B. M.
Fir	697,092
Cedar	14,460
Total	711,552

Average stand per acre of timbered land in feet B. M., 9,300.

COLUMBIA COUNTY.

This county lies in the southeastern portion of the State. Its southern part is occupied by the Blue Mountains, the crest of which runs across the county. Southward they descend rapidly to the canyon of Grande Ronde River and northward to the Columbia Plains. The greater part of the county consists of these plains, which are timberless, with a broadly undulating surface traversed by few streams. The northwest slope of the Blue Mountains was formerly well timbered with pine and fir, but this has mainly been logged off. The summits of these mountains are sparsely timbered, while the southern slopes are timbered quite heavily for this region. There have been no burns in the county.

Classification of lands in Columbia County.

	Square miles.
Total area	876
Merchantable-timber area	164
Cut area	182
Timberless area	530

Estimate of timber in Columbia County.

	M feet B. M.
Pine	109,500
Red fir	36,500
Larch	18,250
White fir	9,125
Spruce	9,125
Total	182,500

Average stand per acre of timbered land in feet B. M., 1,700.

Scattered over the cut area is standing timber to the amount of 60 million feet, which, added to the above estimate, gives a grand total of 242,500 M feet B. M. for the county.

COWLITZ COUNTY.

This county lies in the southern part of the State, being limited on the south by Lewis and Columbia rivers. The eastern portion of the county comprises the western slopes of Mount St. Helens, and includes a considerable area of rugged mountainous country. Aside from this and a few areas of prairie, the county was originally covered with fine merchantable forests. Fires have, however, been extremely disastrous in this county, destroying the timber on large areas, particularly in the eastern and southern parts. Lumbering has been carried on along Columbia and Cowlitz rivers, and considerable areas have thus been denuded; but this bears little comparison to the areas denuded by fire, which comprise fully one-third of the portion originally covered by merchantable forests.

Classification of lands in Cowlitz County.

	Square miles.
Total area	1,145
Merchantable-timber area	646
Barren and rocky	32
Burned area	385
Cut area	82

Estimate of timber in Cowlitz County.

	M feet B. M.
Fir	5,683,311
Spruce	1,089
Cedar	786,691
Hemlock	953,430
Larch	68,126
Total	7,492,647

Average stand per acre of timbered land in feet B. M., 17,800

DOUGLAS COUNTY.

This county lies a little east of the center of the State, its area being comprised entirely within the great plains of the Columbia. It is bordered on the north and west by Columbia River, flowing in a deep and narrow valley. The surface of the county is broadly undulating, consisting of a basalt plateau, intersected by coulees and stream canyons. It is almost entirely treeless, only about 1 per cent of its area being timbered, the timbered areas lying in narrow strips on the edge of the plateau near Columbia River. Along Columbia River, between Wenache and Virginia, are a few scattered pines and firs.

Classification of lands in Douglas County.

	Square miles.
Total area	4,768
Merchantable-timber area	49
Cut area	6
Timberless area	4,713

Estimate of timber in Douglas County.

	M feet B. M.
Yellow pine	23,250
Fir	7,750
Total	31,000

Average stand per acre of timbered land in feet B. M., 1,000.

FERRY COUNTY.

This is a new county, formed in 1899 from the western part of Stevens County, in the northeastern part of the State. Its surface is almost entirely mountainous and broken, and is throughout covered with timber, although the timber is nowhere dense. But one burn of any magnitude has occurred in the county in recent times, and no appreciable amount of timber has been cut.

Classification of lands in Ferry County.

	Square miles.
Total area	2,313
Merchantable-timber area	2,270
Burned area	5
Timberless area	38

Estimate of timber in Ferry County.

	M feet B. M.
Pine	999,900
Fir	333,300
Larch	333,300
Total	1,666,500

Average stand per acre of timbered land in feet B. M., 1,200.

FRANKLIN COUNTY.

This county, which lies in the southeastern part of the State, in the angle between Snake River and the Columbia, is utterly timberless.

GARFIELD COUNTY.

This county lies in the southeastern part of the State, extending from Snake River southward to the Oregon line. The southern part includes a narrow section of the Blue Mountains. These are forested except on the northern slope, which has been largely cut over. The northern portion of the county is comprised in the undulating plain of Snake River and is timberless.

Classification of lands in Garfield County.

	Square miles.
Total area	725
Merchantable-timber area	128
Cut area	70
Timberless area	527

Estimate of timber in Garfield County.

	M. feet B. M.
Pine	89,820
Red fir	29,940
Larch	14,970
White fir	7,485
Spruce	7,485
Total	149,700

Average stand per acre of timbered land in feet B. M., 2,000.

Scattered over the cut area is standing timber to the amount of about 20 million feet, which, added to the above figures, gives a total for the county of 169,700 M feet B. M.

ISLAND COUNTY.

This comprises a group of islands in the northern part of Puget Sound, including Whidby and Camano islands. These islands originally were entirely covered with fir forests, but have been almost completely denuded by the ax.

Classification of lands in Island County.

	Square miles.
Total area, all logged	238

Estimate of timber in Island County.

	M feet B. M.
Fir	250,000
Cedar	180,000
Total	430,000

The above timber is reported as still standing on culled land.

JEFFERSON COUNTY.

This county lies on the Olympic Peninsula, stretching from Hood Canal on the east to the Pacific Ocean. The central portion of the county, comprising three-fourths of it, lies within the Olympic Mountains and contains much rugged country on which the stand of timber is light. Elsewhere the county was formerly heavily forested—on the east with fir, on the west mainly with cedar and spruce. The timber of the eastern portion has been largely destroyed, either by the ax or by fire, mainly by the latter. The timber in the western portion of the county has as yet suffered little from either cause.

The forests of this county are remarkable because of the large proportion of hemlock and lovely fir, more than half the forest being of these species, while of fir, elsewhere the most abundant species, there is comparatively little.

Classification of lands in Jefferson County.

	Square miles.
Total area	1,765
Merchantable-timber area	1,211
Rocky and barren	128
Burned area	158
Mountain meadows	187
Cut area	81

Estimate of timber in Jefferson County.

	M feet B. M.
Red fir	3,033,175
Spruce	843,250
Cedar	2,712,790
Hemlock	8,920,140
Lovely fir	5,182,000
Total	20,691,355

Average stand per acre of timbered land in feet B. M., 26,700.

KING COUNTY.

This county is in the middle of the State north and south, and extends from the crest of the Cascade Range westward to the shores of Puget Sound. Much of the eastern part of the county lies high up in the Cascade Range, where the stand of timber is light. Aside from this and a few trifling areas of prairie, the county was originally heavily forested, but the forests have been largely removed by fire and the ax. The latter has taken the timber from Vashon and Maury islands, from the shores of Puget Sound and of Lakes Washington and Sammamish, and from a broad belt along the line of the Northern Pacific Railway, together with other smaller areas in the interior of the county. Fires have done a vast amount of damage in various parts of the county, mainly in its central portion, although the mountainous regions have not escaped injury.

Classification of lands in King County.

	Square miles.
Total area	2,051
Merchantable-timber area	1,289
Burned area	393
Bare area	8
Cut area	361

Estimate of timber in King County.

	M feet B. M.
Red fir	6,306,494
Hemlock	2,712,971
Cedar	1,555,209
Engelmann spruce	348,103
Lovely fir	439,821

Estimate of timber in King County—Continued.

	M feet B. M.
White fir	75, 233
White pine	130, 577
Noble fir	29, 366
Other species	259, 657
Total	11, 857, 431

Average stand per acre of timbered land in feet B. M., 14,300.

KITSAP COUNTY.

This county occupies the northern part of the peninsula separating Hood Canal from Puget Sound. It was originally entirely covered with heavy fir forests. These have been removed almost completely by the ax from the shores and the islands bordering them. Only a trifling area in the southern portion of the county has been burned, while nearly half the area has been logged. The standing timber consists entirely of fir.

Classification of lands in Kitsap County.

	Square miles.
Total area	407
Merchantable-timber area	210
Cut area	175
Burned area	22

Estimate of timber in Kitsap County.

	M feet B. M.
Fir	1, 140, 900

Average stand per acre of timbered land in feet B. M., 9,000.

KITTITAS COUNTY.

This county lies in the middle of the State north and south, and stretches from Columbia River to the crest of the Cascade Range. The southeastern portion of the county is within the plains region, while the western portion comprises high and rugged mountain spurs. The plains portion is without timber, excepting a narrow strip along Yakima River. The mountain portion is timbered, but by no means heavily, with yellow pine, fir, and larch. Some timber has been cut from this area, especially west of Ellensburg, and in patches in the mountains in the neighborhood of the Northern Pacific Railway. The burned areas are trifling in extent.

Classification of lands in Kittitas County.

	Square miles.
Total area	2, 414
Merchantable-timber area	941
Burned area	118
Timberless area	1, 261
Cut area	94

Estimate of timber in Kittitas County.

	M feet B. M.
Yellow pine	1,349,200
Red fir	546,556
Hemlock	265,911
Tamarack	150,645
White fir	520,000
Cedar	131,000
Lovely fir	78,000
Other species	130,000
Total	3,171,312

Average stand per acre of timbered land in feet B. M., 5,260.

KLICKITAT COUNTY.

This county occupies a long, narrow strip bordering upon Columbia River. Its western end is in the foothills of the Cascade Range, whence it stretches far eastward into the plains. The western portion of the county is timbered, and in certain small areas heavily so. The eastern portion, comprising by far the largest part of the county, is without forests. A few small areas have been cut, and at the western end of the county the great burns of the adjoining county, Skamania, have extended into it. These burns have occurred in recent years and restocking is only just commencing upon them.

Classification of lands in Klickitat County.

	Square miles.
Total area	2,079
Merchantable-timber area	825
Burned area	31
Cut area	26
Timberless area	1,197

Estimate of timber in Klickitat County.

	M feet B. M.
Red fir	336,300
Pine	321,100
Hemlock	71,400
Larch	10,500
Oak	3,700
Total	743,000

Average stand per acre of timbered land in feet B. M., 1,400.

LEWIS COUNTY.

This county is situated in the southwestern part of the State, and extends from the crest of the Cascade Range on the east to the Coast Range on the west, including the valley of Cowlitz River. A considerable portion of its area, therefore, is included within the Cascade Range, where the stand of timber is light. There are many prairies scattered over its surface, which further reduce the original area of merchantable timber.

The timber upon more than one-third of the area of this county has been burned, the burned areas lying mainly in the eastern half of the county, though they are not by any means confined to this part. The cutting of timber has been carried on mainly in the neighborhood of the Northern Pacific Railway, which traverses the county from north to south.

Classification of lands in Lewis County.

	Square miles.
Total area	2,336
Merchantable-timber area	1,396
Rocky and barren	11
Timberless area	45
Burned area	813
Cut area	71

Estimate of timber in Lewis County.

	M feet B. M.
Red fir	8,848,113
Hemlock	929,755
Cedar	1,118,975
White fir	158,941
Noble fir	143,491
Alaska cedar	18,451
Larch	1,406
Other species	159,030
Total	11,378,162

Average stand per acre of timbered land in feet B. M., 12,800.

LINCOLN COUNTY.

This county lies in the eastern portion of the State, upon the great plains of the Columbia, and is bordered on the north by Columbia and Spokane rivers. Its surface is a broad, undulating, basalt plain, traversed by a few stream courses and numerous coulees. The timber consists mainly of yellow pine, and is found in the northern part of the county, near Columbia and Spokane rivers. Formerly it extended in a continuous belt across the county in the neighborhood of these streams, but most of it has been cut away for cord wood and saw logs. The stand is very light.

Classification of lands in Lincoln County.

	Square miles.
Total area	2,299
Merchantable-timber area	63
Cut area	200
Timberless area	2,036

Estimate of timber in Lincoln County.

	M feet B. M.
Pine	10,200
Fir	1,800
Total	12,000

Average stand per acre of timbered land in feet B. M., 300.

Scattered over the cut area is a little standing timber, amounting to about 2,000,000 feet, which, added to the above estimate, gives a total of 14,000 M feet B. M. for the county.

MASON COUNTY.

This county includes the southeastern part of the Olympic Mountains and much of the country bordering Hood Canal. With the exception of a few small prairie tracts, it was originally heavily timbered. Fires have done little damage, but timber cutting has been extensive. The forests have been removed from the shores of Hood Canal and other inlets from Puget Sound, as well as from much of the interior of the county; indeed, it appears that nearly two-fifths of the area has been logged.

The forest consists almost entirely of fir, the amount of other species being trifling.

Classification of lands in Mason County.

	Square miles.
Total area	993
Merchantable-timber area	729
Barren and rocky	20
Burned area	31
Mountain meadows	14
Cut area	199

Estimate of timber in Mason County.

	M feet B. M.
Red fir	4,953,121
Spruce	8,492
Cedar	437,778
Hemlock	1,174,038
Lovely fir	456,000
Total	7,029,429

Average stand per acre of timbered land in feet B. M., 15,000.

OKANOGAN COUNTY.

This large county lies in the northern part of the State, along the Canadian border, and about midway between the east and west boundaries. A large part of the county is comprised within the limits of the Washington Forest Reserve, where the stand of timber is light. Most of the remaining part of the county is timbered but little. It is, in the main, a mountainous region, containing, however, the broad valley of Okanogan River, which traverses it from north to south, while along the southern edge flows Columbia River in a narrow valley. No lumbering has been carried on in the county, and the forests have not suffered in recent times by fire.

Classification of lands in Okanogan County.

	Square miles.
Total area	5,318
Timbered area	4,468
Timberless area	850

Estimate of timber in Okanogan County.

	M feet B. M.
Yellow pine	2,765,060
Fir	533,100
Larch	533,100
Total	3,831,260

Average stand per acre of timbered land in feet B. M., 1,340.

PACIFIC COUNTY.

This is the southwesternmost county of the State, bordering upon the Pacific Ocean and Columbia River. In the interior its surface is somewhat broken by the Coast Range, although the relief is nowhere great. It is drained by Willapa and Nasel rivers.

Originally the entire surface, with the exception of a few sandy tracts near the coast, was covered with fine forests, composed almost entirely of fir in the interior and of cedar and spruce near the coast.

Logging has been carried on along the two rivers above mentioned, and to some extent immediately on the coast. Altogether only an area of 42 square miles has been logged.

Fires have not been especially prevalent or destructive in this county, having destroyed the timber upon an area of only 59 square miles.

Classification of lands in Pacific County.

	Square miles.
Total area	925
Merchantable-timber area	764
Cut area	56
Timberless area	40
Burned area	65

Estimate of timber in Pacific County.

	M feet B. M.
Fir	5,498,224
Spruce	814,953
Cedar	713,238
Hemlock	786,652
Total	7,813,067

Average stand per acre of timbered land in feet B. M., 16,300.

PIERCE COUNTY.

This, one of the western counties of the State, extends from the crest of the Cascade Range westward to Puget Sound, and includes several islands in the sound. In the east it includes Mount Rainier, with an altitude exceeding 14,500 feet, from whose summit radiate great areas of snow and ice. A large area in the eastern part of this county, lying high up in the range, is sparsely timbered. A considerable area has been logged, including nearly all of the islands, large tracts around the city of Tacoma, and others along White and Puyallup rivers.

This county has been singularly free from fires, only a trifling area having as yet been burned. There are, however, large tracts covering many scores of square miles south of the city of Tacoma which are naturally timberless.

Classification of lands in Pierce County.

	Square miles.
Total area	1,554
Merchantable-timber area	1,079
Rocky and barren	40
Timberless area	159
Burned area	76
Cut area	200

Estimate of timber in Pierce County.

	M feet B. M.
Red fir	6,798,950
Spruce	200,871
Cedar	1,192,539
Hemlock	2,099,780
White pine	86,878
Noble fir	93,458
White fir	61,565
Alaska cedar	94,034
Other species	240,365
Total	10,868,440

Average stand per acre of timbered land in feet B. M., 15,700.

SAN JUAN COUNTY.

This, one of the northwestern counties of the State, is composed entirely of islands in Puget Sound, the principal of which are San Juan, Orcas, Lopez, Blakely, Shaw, and Waldron.

All these islands were originally covered with a heavy forest, composed of red fir almost exclusively, but, being easily accessible, the entire area has been logged.

SKAGIT COUNTY.

This is in the northwestern portion of the State, and extends from the crest of the Cascade Range to Puget Sound, including a number of islands in the sound. The eastern portion, including much more than half the county, being mountainous, has a light stand of timber. The western portion, comprising perhaps one-third of the county, was formerly entirely forested, with the exception of a considerable tract of prairie about the mouth of Skagit River.

There have been no fires of magnitude within the county, but logging has been extensively carried on. The islands have been cleared entirely, and the lands in the neighborhood of the coast and the immediate valley of Skagit River have been cleared as far up as the mouth of the Sauk.

Classification of lands in Skagit County.

	Square miles.
Total area	1,874
Merchantable-timber area	1,576
Burned area	12
Cut area	196
Timberless area	90

Estimate of timber in Skagit County.

	M feet B. M.
Fir	6,297,350
Cedar	2,716,326
Hemlock	1,900,339
Spruce	184,096
Total	11,098,111

Average stand per acre of timbered land in feet B. M., 11,000.

SKAMANIA COUNTY.

This county is in the southern portion of the State, bordering on Columbia River, and extending thence northward well into the Cascade Range. In the northwestern portion of the county is the extinct volcano of St. Helens, while well into the northeast extend the western spurs of Mount Adams. The northern portion of the county is therefore extremely rugged, mountainous, and elevated, and the spurs from these mountains extend southward nearly to Columbia River.

The northern half of the county has a light stand of merchantable timber, although, with the exception of the summits of the highest mountains, which are above timber line, it is wooded. The southern half was at one time quite heavily timbered, especially toward the west. In recent years, however, fires have destroyed the timber in more than half the area of the county. The fires have invaded the eastern and western portions, leaving between them a narrow belt of forests, together with a broad strip along Columbia River; indeed, the timber upon more than half the area of the county has been thus destroyed.

But little of the timber of this county has been cut. Logging operations extend along Columbia River across the county, reaching perhaps a mile back from the river and up a few of the streams flowing into it.

The forests of this county consist largely of fir and hemlock. The amount of cedar is trifling, and there is no spruce.

Classification of lands in Skamania County.

	Square miles.
Total area	1,743
Merchantable-timber area	1,209
Burned area	459
Timberless area	44
Cut area	31

Estimate of timber in Skamania County.

	M feet B. M.
Red fir	6,117,212
Cedar	455,115
Hemlock	1,948,042
Noble fir	980,065
Lovely fir	639,605
Tamarack	539,290
White fir	295,207
Yellow pine	230,845
White pine	229,573
Larch	12,700
Other species	423,161
Total	11,870,815

Average stand per acre of timbered land in feet B. M., 15,300.

SNOHOMISH COUNTY.

This county extends from the crest of the Cascade Range to Puget Sound. The eastern part is composed of high and rugged mountains, with a light stand of timber. The western half was originally forested, with the exception of a few tracts of prairie. Logging has, however, been carried on extensively in this county, two-fifths of the area formerly timbered having been stripped by the ax. Burns have not been extensive or destructive.

Classification of lands in Snohomish County.

	Square miles.
Total area	1,651
Merchantable-timber area	1,252
Burned area	119
Timberless area	28
Cut area	252

Estimate of timber in Snohomish County.

	M feet B. M.
Red fir	7,356,557
Cedar	2,050,830
Hemlock	1,055,737
Lovely fir	214,742
White fir	64,423
Engelmann spruce	42,955
Other species	107,371
Total	10,892,195

Average stand per acre of timbered land in feet B. M., 13,500.

SPOKANE COUNTY.

This county is situated along the Idaho boundary, and lies about midway between the north and south boundaries of Washington. The eastern part is somewhat hilly and broken, while the western part consists of a portion of the great basaltic plain of the Columbia, intersected by numerous coulees, but traversed by few flowing streams.

Much of the area of this county was formerly timbered, but the timber has been in great part cut away to supply the needs of Spokane and other towns. Very little of the timber has suffered from fire.

Classification of lands in Spokane County.

	Square miles.
Total area	1,777
Merchantable-timber area	530
Burned area	8
Cut area	585
Timberless area	654

Estimate of timber in Spokane County.

	M feet B. M.
Pine	532,400
Larch	121,360
Fir	32,680
Cedar	29,560
Total	716,000

Average stand per acre of timbered land in feet B. M., 2,100.

In the cut area there is still standing scattered timber estimated altogether at 50 million feet, which, added to the above, gives a total of 766,000 M feet B. M. for the county.

STEVENS COUNTY.

This is the northeastern county of the State. It is bordered on the west by Columbia River, while much of its southern boundary is formed by Spokane River. It is, in the main, a mountainous region, but is intersected by the broad valleys of Clark Fork and other streams. Nearly all of its area is timbered, but nowhere densely. Burned areas are more extensive here than in any other of the eastern counties, and there has been considerable cutting in scattered localities.

The species of timber found in the county consist of pine, in which is included both yellow and Western white pine, which are not distinguished, red fir, larch, and cedar. In the western portion of the county, along Columbia River, the timber consists almost entirely of pine, only 4 per cent being fir and 1 per cent larch. In the neighborhood of Colville River the proportion of pine diminishes to 75 per cent and that of fir and larch increases to 10 per cent each, while the proportion of cedar reaches 5 per cent. In the southeastern part of the county the proportion of pine is still further reduced to 60 per cent, while larch increases to 30 per cent, the remainder being made up of equal proportions of fir and cedar. Along the line of the Great Northern Railroad, in the southern corner of the county, the proportion of larch is still greater, reaching 50 per cent in certain small areas.

Classification of lands in Stevens County.

	Square miles.
Total area	3,945
Merchantable-timber area	3,643
Cut area	23
Burned area	159
Timberless area	120

Estimate of timber in Stevens County.

	M feet B. M.
Pine	2,026,260
Larch	351,218
Fir	297,185
Cedar	27,017
Total	2,701,680

Average stand per acre of timbered land in feet B. M., 1,100.

THURSTON COUNTY.

This county lies in the western part of the State, bordering on the north upon Puget Sound. Its area was, with the exception of numerous prairie tracts, originally covered entirely with fine forests, mainly of fir. At present all the forests in the neighborhood of Puget Sound have been cut away. Fires have not been prevalent, and but little timber has been destroyed by this means.

Classification of lands in Thurston County.

	Square miles
Total area	763
Merchantable-timber area	430
Burned area	66
Cut area	161
Timberless area	106

Estimate of timber in Thurston County

	M feet B. M.
Fir	2,6[illegible],125
Spruce	482
Cedar	106,940
Hemlock	[illegible]
Total	2,787,343

Average stand per acre of timbered land in feet B. M., 10,100

WAHKIAKUM COUNTY.

This county lies in the southwestern part of the State, bordering Columbia River. With the exception of some islands in the Columbia and small tracts about the mouths of certain tributary streams, the entire area was heavily forested. Lumbering has been carried on along the shores of the Columbia and on Gray and Deep rivers. Fires also have been somewhat prevalent in the county, but more than two-thirds of its area is still covered by fine forests.

Classification of lands in Wahkiakum County.

	Square miles
Total area	[illegible]
Merchantable-timber area	[illegible]
Burned area	[illegible]
Cut area	[illegible]
Timberless area	22

Estimate of timber in Wahkiakum County.

	M feet B. M.
Fir	[illegible]
Spruce	[illegible]
Cedar	[illegible]
Hemlock	[illegible]
Total	[illegible]

Average stand per acre of timbered land in feet B. M., [illegible]

WALLA WALLA COUNTY.

This county lies in the southeastern part of the State, being bordered on the north by Snake River and on the west by Columbia River. Its surface is an undulating plain, sloping northward and westward from Blue Mountains.

The amount of timber in this county was originally small, and this has been entirely logged off, with the exception of about 4,500,000 feet left standing after logging operations. Of this, about half is pine, one-fourth fir, and one-fourth larch.

Classification of lands in Wallawalla County.

	Square miles.
Total area	1,277
Merchantable-timber area	33
Cut area	14
Timberless area	1,230

Estimate of timber in Wallawalla County.

	M feet B. M.
Pine	2,250
Fir	1,625
Larch	1,625
Total	5,500

Average stand per acre of timbered land in feet B. M., 213.

WHATCOM COUNTY.

This is the most northern county of the State west of the Cascade Range. It extends west from the summit of the range to the shores of Puget Sound. In the eastern half of the county are found Mounts Baker and Shuksan, two great extinct volcanoes, rising high above timber line. This eastern mountainous half of the county has a light stand of timber. The western half was originally very heavily timbered. Its forests were probably as dense as those of any other county in the State, but they have been almost entirely destroyed by fire. Certain areas along the coast, on Nooksak River and on the Bellingham Bay and British Columbia Railroad, have been logged, but the amount of timber thus utilized is small as compared with that destroyed by fire. To illustrate the extent of this devastation, it may be stated that out of a timbered area of 1,387 square miles not less than 636 square miles have been burned; 170 square miles have been logged.

The forest consists almost entirely of fir and cedar, the amounts of hemlock and spruce being trifling.

Classification of lands in Whatcom County.

	Square miles.
Total area	2,226
Merchantable-timber area	1,387
Burned area	636
Cut area	170
Timberless area	33

Estimate of timber in Whatcom County.

	M feet B. M.
Fir	1,905,962
Cedar	596,342
Hemlock	188,071
Spruce	18,580
Total	2,708,955

Average stand per acre of timbered land in feet B. M., 3,000.

WHITMAN COUNTY.

This county is in the eastern part of the State, bordering upon Idaho. Its surface is a broadly undulating plain of basalt sloping to the eastward.

It formerly contained a few small areas of timber land in the eastern and northern parts, but these have been logged over, leaving, however, a small amount of timber still standing.

Classification of lands in Whitman County.

	Square miles.
Total area	2,105
Merchantable-timber area	19
Cut area	109
Timberless area	1,977

Estimate of timber in Whitman County.

	M feet B. M.
Yellow pine	35,000

Average stand per acre of timbered land in feet B. M., 3,000.

In the cut areas there is still standing a little timber, estimated at 35 million feet, consisting mainly of yellow pine.

YAKIMA COUNTY.

This county lies in the middle-southern portion of the State, being bordered upon the east by the Columbia River, and extending on the west to the crest of the Cascade Range. The western portion of the county is included within the Mount Rainier Forest Reserve. The estimates of area and of stand of timber do not include the reserve portion.

The eastern portion of the county consists of a broadly undulating plain, and is without forests. The western portion lies in the Cascade Range, is mountainous and broken, and is timbered throughout, but for the most part not heavily. There has been considerable cutting in the lower edges of the mountain forests, particularly upon Naches River, where a large area has been logged. There are no burns except in the southwest corner of the county.

Classification of lands in Yakima County.

	Square miles.
Total area	5,784
Merchantable-timber area	1,788
Rocky and barren	2
Burned area	139
Timberless area	3,738
Cut area	117

Estimate of timber in Yakima County.

	M feet B. M.
Fir	1,261,033
Yellow pine	2,099,788
Tamarack	433,154
White pine	93,406
Mountain fir	2,957
Patton hemlock	1,774
Hemlock	121,300
Lodgepole pine	1,183
Cedar	60,600
Other species	172,377
Total	4,247,572

Average stand per acre of timbered land in feet B. M., 3,620.

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PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Professional Paper No. 5.]

The serial publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of the United States—folios and separate sheets thereof, (8) Geologic Atlas of the United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

The Bulletins, Professional Papers, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, Methods of hydrographic investigation; N, Water power; O, Underground waters; P, Hydrographic progress reports. This paper is the second in series H. The first is Professional Paper No. 4, The Forests of Oregon, by Henry Gannett, now in press (36 pp., 7 pls.).

Three volumes on forestry have been published, as Part V of the Nineteenth, Twentieth, and Twenty-first annual reports, each consisting of several papers.

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6

J. C. Branner

Professional Paper No. 6 Series H, Forestry, 3

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

FOREST CONDITIONS

IN THE

CASCADE RANGE, WASHINGTON

BETWEEN THE WASHINGTON AND MOUNT RAINIER FOREST RESERVES

BY

FRED G. PLUMMER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1902

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FOREST CONDITIONS IN CASCADE RANGE BETWEEN THE WASHINGTON AND MOUNT RAINIER FOREST RESERVES.

By Fred G. Plummer.

GENERAL DESCRIPTION.

This report covers that portion of the Cascade Mountains in the State of Washington lying between the Mount Rainier Forest Reserve and the Washington Forest Reserve. It may be more particularly described by Government subdivision surveys as comprising townships 19 to 28 north, and from range 9 east eastward to the Columbia River.

The land-classification map submitted herewith, Pl. I, covers 2,800,000 acres, of which 261,350 acres are naturally timberless areas, such as arid lands, lakes, and glaciers. The remainder, or 2,538,650 acres, is a naturally timbered country, but has lost 204,140 acres, or 8.04 per cent, by fires, and 41,640 acres, or 1.64 per cent, by logging, thus leaving 2,292,870 acres which can at this time be called timber lands. Although these burned and logged areas have to be deducted in estimating the timber, they are nevertheless included in the maps showing the distribution of the various species, for the reason that they lie within the timber zones, and either are or will be restocked with those species that now form the bordering forests.

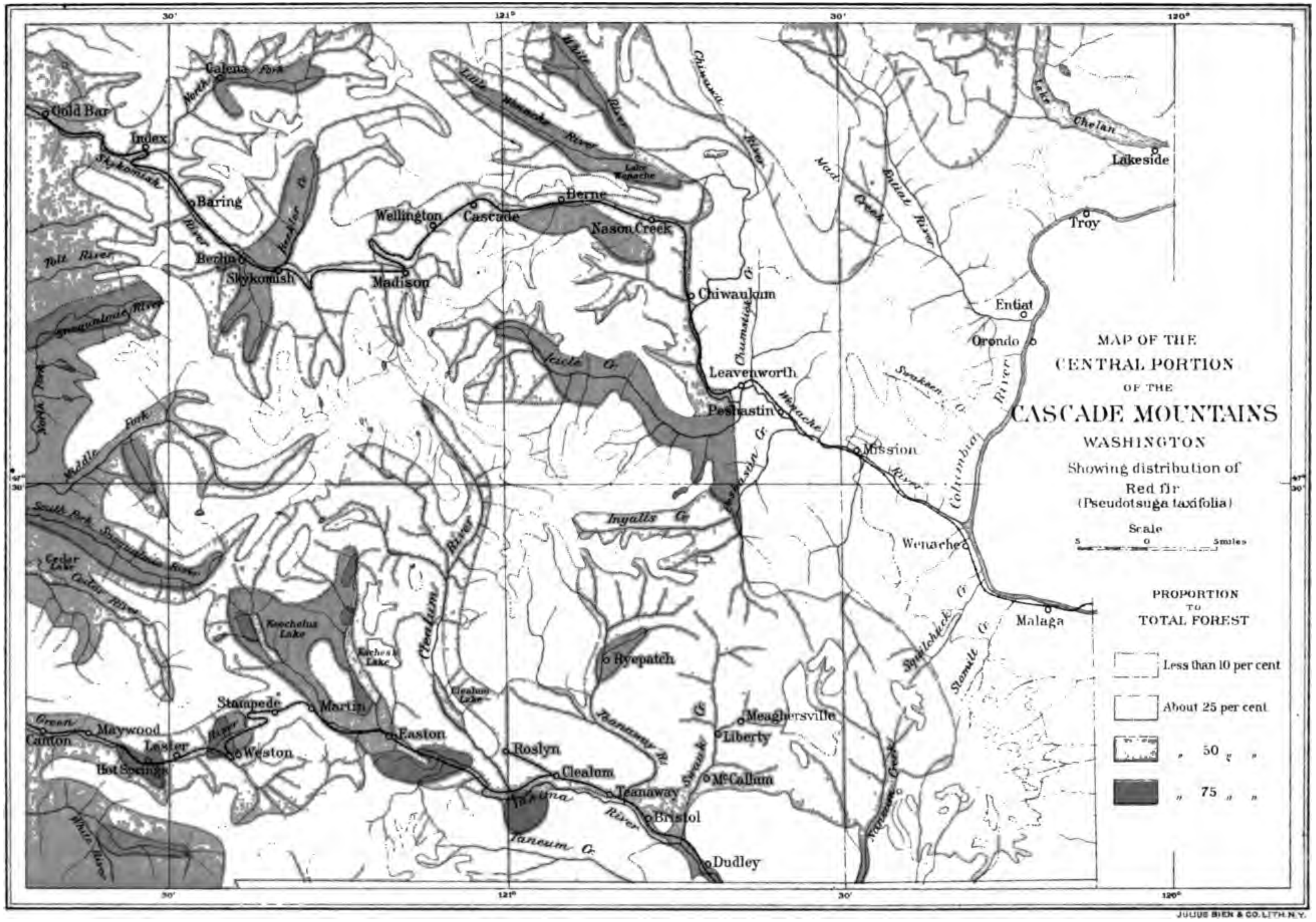
Of the total area, 179,400 acres, or 6.4 per cent, are estimated as arable; and of this, 13,614 acres, or 7.6 per cent, are under cultivation. The detailed treatment of these areas will be found under the several watersheds and also under the heading "Irrigation."

The estimate of the timber now standing upon the 2,292,870 acres of timbered land is 12,001,510 M feet B. M., which gives an average per acre of 5,234 feet B. M. This estimate at first sight appears low, but it results from the fact that 1,520,700 acres, or 66 per cent, of the timbered area are upon the eastern slope of the mountains, which supports a much more open and lighter forest than does the western slope. The average stand of timber for the western slope is 9,506 feet B. M. per acre, while that for the eastern slope is but 3,064 feet B. M. per acre.

The summit of the Cascade Mountains, as delineated upon the map, is that irregular line which marks the division of the surface drainage westward into Puget Sound and eastward into the Columbia River. This geographical summit is not colinear with the geological summit, nor with the "botanical summit," by which is meant that line which would divide the characteristic western from the eastern growth. Upon the large-scale map this line would be a band or strip varying in width from 4 to 8 miles, and in this strip the timber features of both slopes would overlap, and this overlap strip would extend along the eastern slope, paralleling the geographical summit. In other words, the timber of the western slopes has flowed eastward over the geographical summit—freely through the low passes and with difficulty through the higher saddles or over the ridges and peaks.

The climatology of this region must of necessity be written in a very general manner, as the data are of a fragmentary character and not always trustworthy. The first general truth is that the western slope is a region of excessive humidity, which, with the timber, overlaps slightly onto the eastern slope. The remainder of the eastern slope shows a decrease of precipitation eastward, reaching its minimum in the arid regions of eastern Washington, approximately in R. 30 E. Extremes of temperature prevail east of the mountains, while the western slope has a more equable climate. As a result, the greatest depths of snow are found in the overlap, where the precipitation is great and the winter temperatures are low. The precipitation is heaviest in the Snoqualmie and Cedar River watersheds, and in these it is probably greatest in the Middle Fork Basin, in T. 23 N., R. 11 E. The testimony on this matter from the few who knew the region would warrant the belief that the rainfall exceeds that of any other point in Washington, Clearwater perhaps excepted. Observations at North Bend, in T. 23 N., R. 8 E., show 90 inches annually, and all agree that it rains very much more at Middle Fork. Without vouching for the correctness of this, it is fair to say that my experiences during the last week of the ordinarily dry month of August were exasperatingly confirmatory. In one day, while walking 10 miles along the valley, I crossed more than seventy running streams, of which seven were about 15 feet wide. These streams drained the northern side of that prominent spur of the Cascade Mountains which ends in Preacher Mountain, and none of them could have been over 3 miles in length.

Snoqualmie and Cedar River watersheds, mentioned above, together with the Yakima watershed, on the eastern slope, are deserving of special mention in this report for the reason that the entire minimum flow from their catchment basins will be utilized in the near future for purposes of vital importance. Snoqualmie River now furnishes light and power for the cities of Tacoma and Seattle; Cedar River



MAP OF THE
CENTRAL PORTION
OF THE
CASCADE MOUNTAINS
WASHINGTON
Showing distribution of
Red fir
(Pseudotsuga taxifolia)

JULIUS BIEN & CO. LITH. N.Y.

supplies the water to Seattle, and the Yakima irrigates the most important farm lands of the State. Fortunately, large lakes which can be made into impounding reservoirs are well situated in all these watersheds, and their utilization is already receiving serious consideration.

The Northern Pacific and Great Northern railways cross the Cascade Mountains in the area under consideration in this report. For the protection of their roads from forest fires and from falling trees, the rights of way have been cut from 50 to 400 feet in width, according to the condition and size of the timber and the topography. The desire is to remove every tree or snag which threatens the roadbed, sparing nothing which in falling would reach the tracks.

The Cascade Range has been no barrier to the shipment of lumber since the building of these railroads. Large quantities of the fir, spruce, and cedar of the western slopes are shipped for use in eastern Washington, as the better quality of the timber fully compensates for the additional hauling. The yellow pine and tamarack, found only on the eastern slopes, are inferior to the western woods and are never shipped westward except as crates or boxes for fruits or melons.

TREES AND SHRUBS.

List of trees and shrubs found in central Washington.

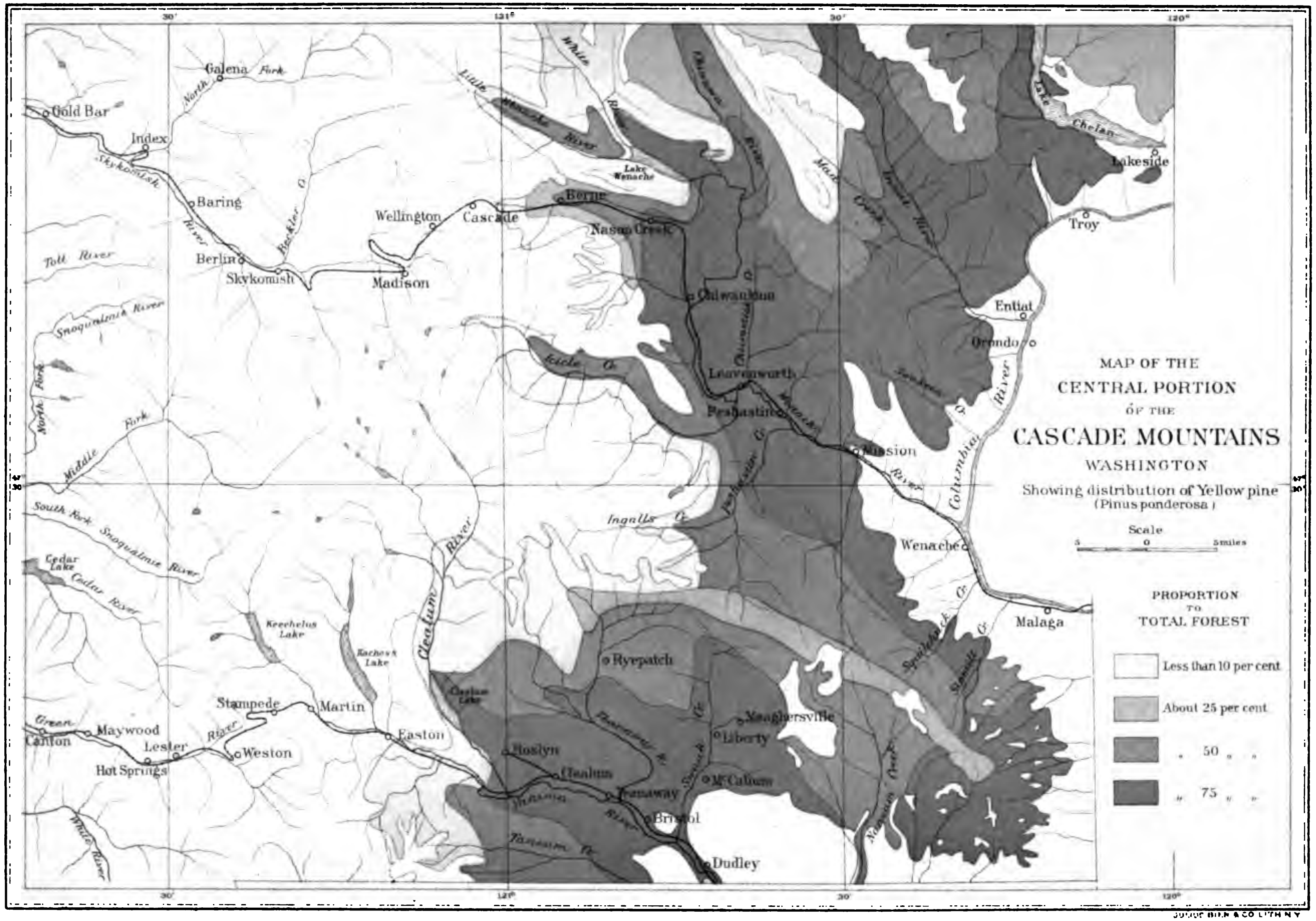
CONIFERS.

White pine	Pinus monticola.
Yellow pine	Pinus ponderosa.
Lodgepole pine	Pinus murrayana.
White-bark pine	Pinus albicaulis.
Noble fir	Abies nobilis.
Lovely fir	Abies amabilis.
White fir	Abies grandis.
Subalpine fir	Abies lasiocarpa.
Mertens hemlock	Tsuga mertensiana.
Patton hemlock	Tsuga pattoniana.
Engelmann spruce	Picea engelmanni.
Red fir	Pseudotsuga taxifolia.
Red cedar	Thuja plicata.
Alaska cedar	Chamæcyparis nootkatensis.
Tamarack	Larix occidentalis.
Alpine larch	Larix lyallii.
Yew	Taxus brevifolia.
Creeping juniper	Juniperus nana.

DECIDUOUS TREES AND SHRUBS.

Cottonwood	Populus trichocarpa.
Quaking aspen	Populus tremuloides.
Maple	Acer macrophyllum.

Vine maple	Acer circinatum.
Dwarf maple	Acer glabrum.
Mountain alder	Alnus viridus.
Red alder	Alnus oregona.
Mountain ash	Sorbus occidentalis.
Longleaf willow	Salix fluviatilis.
Lyall willow	Salix lasiandra lyalli.
	Salix glabra.
Silver willow	Salix sitchensis.
Redberry elder	Sambucus callicarpa.
Blueberry elder	Sambucus glauca.
Sweet myrtle	Ceanothus velutinus.
Thorn apple	Cratægus macracantha.
Dogwood	Cornus nuttallii.
Highbush cranberry	Viburnum pauciflorum.
Bearberry	Rhamnus purshiana.
Syringa	Philadelphis lewisii.
Arrow wood	Spirea discolor.
Buckbrush	Spirea rosea.
Buckbrush	Spirea corymbosa.
Sumach	Rhus glabra.
Birch	Betula sp.
Chokecherry	Prunus demissa.
Wild cherry	Prunus emarginata.
Greasewood	Purshia tridentata.
	Menziesia ferruginea.
Sagebrush	Artemisia tridentata.
Hazel	Corylus rostrata.
Snowberry	Symphoricarpos racemosus.
Oregon grape	Berberis aquafolium.
Oregon grape	Berberis repens.
Devil's club	Echinopanax horridum.
Manzanita	Arctostaphylos uva-ursi.
Kinnikinick	Arctostaphylos nevadensis.
	Lonicera involucrata.
Red currant	Ribes sanguineum.
Mountain salal	Gaultheria ovatifolia.
Red huckleberry	Vaccinium myrtillus microcephyllum.
Black huckleberry	Vaccinium ovatum.
Thimbleberry	Rubus nutkanus.
Salmonberry	Rubus spectabilis.
Blackberry	Rubus ursinus.
Raspberry	Rubus leucodermis.
Prickly gooseberry	Ribes lacustre mollis.
Blackberried gooseberry	Ribes divaricatum.



MAP OF THE
CENTRAL PORTION
OF THE
CASCADE MOUNTAINS
WASHINGTON
Showing distribution of Yellow pine
(Pinus ponderosa)

JULIUS BIEN & CO. LITH. N.Y.

DISTRIBUTION OF SPECIES BY ZONES.

The various species of cone-bearers found in the State of Washington have generally been considered in four zones, although it is difficult, indeed, to establish a line of division at any altitude, owing to the fact that the species vary greatly in altitudinal range on opposite slopes of the mountains, and also according to conditions of exposure and moisture. The assignment of the various species to these zones was in conformity with the conditions found in the basins of streams tributary to Columbia River where it cuts the Cascade Range, in latitude 45° 30′. The four zones referred to are as follows:

Forest zones in Washington at latitude 45° 30′.

Yellow-pine zone	Below 3,000 feet
Lodgepole-pine zone	3,000 to 5,000 feet
Subalpine-fir zone	5,000 to 6,000 feet
Whitebark-pine zone	6,000 to 7,400 feet or to timber line

The species are assigned to the zones as follows:

Species comprising forest zones in central Washington at latitude 45° 30′.

YELLOW-PINE ZONE.	
Yellow pine	Pinus ponderso.
Red and yellow fir	Pseudotsuga taxifolia.
White fir	Abies grandis.
Red cedar	Thuja plicata.
LODGEPOLE-PINE ZONE.	
Lodgepole pine	Pinus murrayana.
White pine	Pinus monticola.
Engelmann spruce	Picea engelmanni.
Yew	Taxus brevifolia.
SUBALPINE-FIR ZONE.	
Subalpine fir	Abies lasiocarpa.
Lovely fir	Abies amabilis.
Noble fir	Abies nobilis.
Mertens hemlock	Tsuga mertensiana.
Alaska cedar	Chamaecyparis nootkatensis.
Tamarack	Larix occidentalis.
WHITE-BARK-PINE ZONE.	
White-bark pine	Pinus albicaulis.
Patton hemlock	Tsuga pattoniana.
Alpine larch	Larix lyallii.
Creeping juniper	Juniperus nana.

As might be expected, the assignment thus made will not apply to the area under consideration. The difference in latitude is not great, amounting to only 150 miles, but the climatic conditions are quite different, and compel a new assignment of the species to these zones. It does not appear necessary to change the names of the zones, as the conditions are such as to warrant their use to the northern boundary of the United States, at latitude 49°.

The accompanying diagram, Pl. VII (p. 20), shows the range and development of the trees having any value as timber, including some of the deciduæ; and on comparison with a similar diagram[a] prepared by me for the Mount Rainier Forest Reserve, it shows a general lowering in altitude. The diagram made for the Mount Rainier Forest Reserve, with its average latitude of about 46° 30′, shows an intermediary condition between the assignment just given for latitude 45° 30′ and that which will now be given for latitude 47° 30′.

Species comprising forest zones in central Washington at latitude 47° 30′.

YELLOW-PINE ZONE.	
Yellow pine	Pinus ponderosa.
Red fir	Pseudotsuga taxifolia.
White fir	Abies grandis.
Red cedar	Thuja plicata.
Mertens hemlock	Tsuga mertensiana.
LODGEPOLE-PINE ZONE.	
Lodgepole pine	Pinus murrayana.
White pine	Pinus monticola.
Engelmann spruce	Picea engelmanni.
Noble fir	Abies nobilis.
Lovely fir	Abies amabilis.
Tamarack	Larix occidentalis.
Alaska cedar	Chamæcyparis nootkatensis.
Yew	Taxus brevifolia.
SUBALPINE-FIR ZONE.	
Subalpine fir	Abies lasiocarpa.
Patton hemlock	Tsuga pattoniana.
WHITE-BARK-PINE ZONE.	
White-bark pine	Pinus albicaulis.
Alpine larch	Larix lyallii.
Creeping juniper	Juniperus nana.

The range and development of the Alpine larch and creeping juniper are not shown on the diagram, as they did not deserve the extended observations necessary for their determination.

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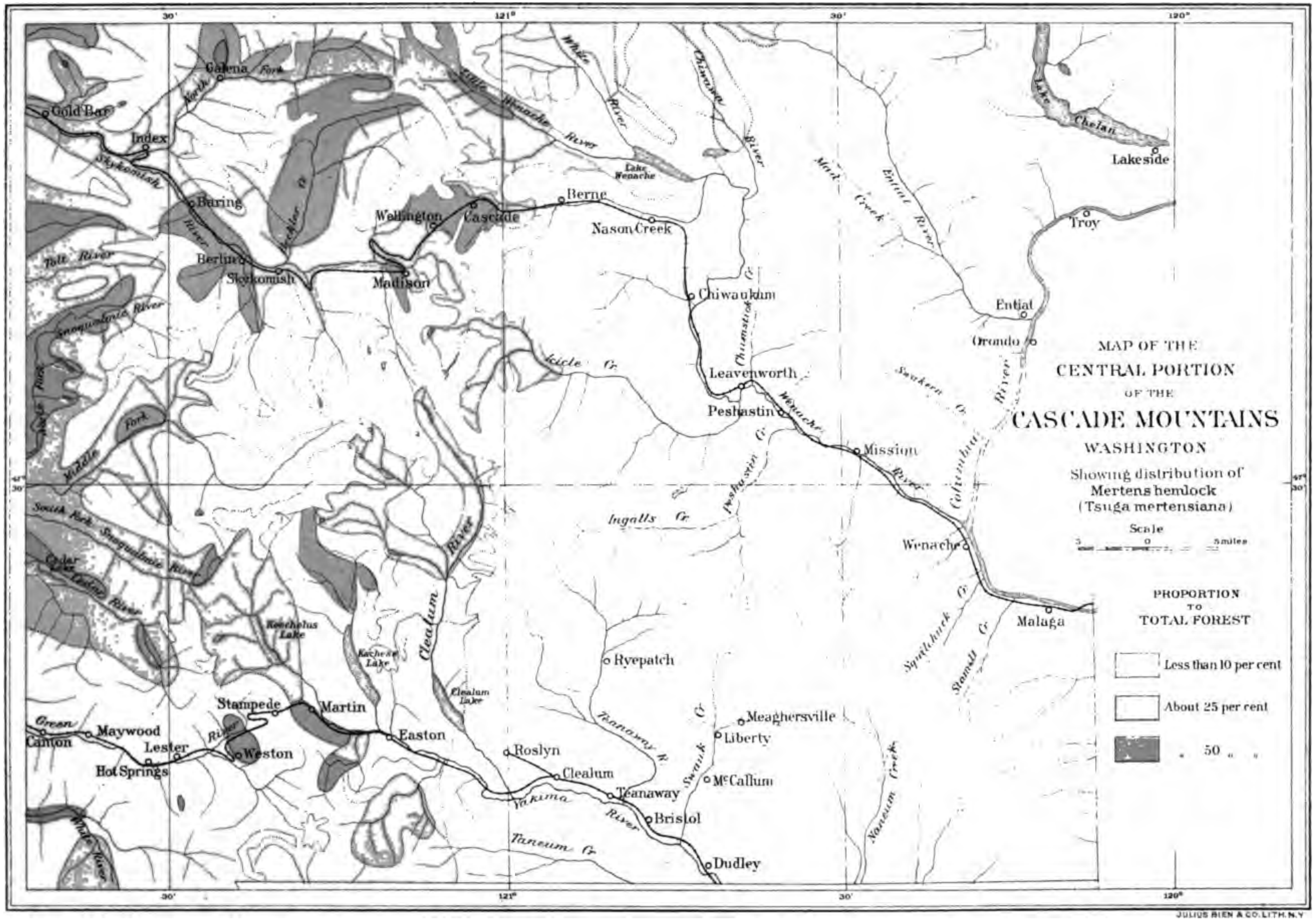
[a] Twenty-first Ann. Rept. U. S. Geol. Survey, Pt. V, Pl. XLI, p. 102.



MAP OF THE
CENTRAL PORTION
OF THE
CASCADE MOUNTAINS
WASHINGTON
Showing distribution of
Mertens hemlock
(Tsuga mertensiana)

JULIUS BIEN & CO. LITH. N.Y.

EXAMINATION OF A TYPICAL ACRE.

For the purpose of making a detailed record of the amount of vegetable growth supported by the average soil of the Cascade Mountains, an acre was measured near Martin, a station on the Northern Pacific Railway, in an area which had just been estimated as bearing 2,000 to 5,000 feet B. M. per acre. Every tree and sapling, living or dead, was measured and counted. The result was 6,930.8 feet B. M., or 1,930.8 feet more than the maximum of our estimate; but this does not mean that the estimate was erroneous. The fact is that a Michigan mill would cut about 4,000 feet from this acre, and a large western Washington mill would not touch it at all, for their cruisers would note so many piles, ties, telephone poles, or cords of wood, all roughly estimated, and pass on, looking for logs that would square at least 14 inches at the small end. Therefore the following lists of coniferous trees, deciduous trees, and shrubs and flowering plants will be found most interesting and valuable as correctly showing the yield of 1 acre of wildwood.

Number and estimates of the trees found on 1 acre, near Martin.—Elevation 2,700 feet.

Species.	Living.				Dead.				Down.		Total number feet B. M. loggers' scale (Doyle).		
	Over 12 inches diameter.	4 inches to 12 inches diameter.	0 inch to 4 inches diameter.	Real contents, feet B. M.	Over 12 inches diameter.	4 inches to 12 inches diameter.	0 inch to 4 inches diameter.	Real contents, feet B. M.	Fallen.	Cut.	Living.	Dead.	Total.
Red fir (Pseudotsuga taxifolia)	25	7	18	7,231	37	30	...	1,472	2	8	2,892.4	588.8	3,481.2
Mertens hemlock (Tsuga mertensiana)	27	53	60	6,065	9	...	...	1,498	1	...	2,426.0	599.2	3,025.2
White pine (Pinus monticola)	3	7	216	351	...	...	...	...	1	...	140.4	...	140.4
Lodgepole pine (Pinus murrayana)	...	...	10	...	...	...	...	...	...	...	...	...	...
Lovely fir (Abies amabilis)	1	10	50	384	...	...	...	...	...	...	145.6	...	145.6
Noble fir (Abies nobilis)	1	1	...	346	...	...	...	...	...	...	138.4	...	138.4
White fir (Abies grandis)	...	...	...	...	...	...	...	...	...	1	...	...	...
Red cedar (Thuja plicata)	...	6	45	...	...	...	...	...	...	2	...	...	...
Total	57	84	399	14,377	46	30	...	2,970	4	11	5,742.8	1,188.0	6,930.8

There were also found upon this acre the following deciduous trees and shrubs and flowering plants:

Deciduous trees and shrubs and flowering plants found on sample acre near Martin, Wash.

DECIDUOUS TREES AND SHRUBS.

Populus trichocarpa.
Salix glabra.
Alnus viridus.
Sorbus occidentalis.
Acer circinatum.
Amalanchier alnifolia.
Ribes cereum.
Vicinium myrtilloides.
Vicinium parviflorum.
Berberis aquafolium.
Pachystina myrsinites.
Rosa gymnocarpa.

FLOWERING PLANTS.

Xerophyllum tenax.
Senecio triangularis.
Chimaphila umbellata.
Clintonia uniflora.
Lillium columbianum.
Linnæ borealis.
Epilobium angustifolium.
Pedicularis contorta.

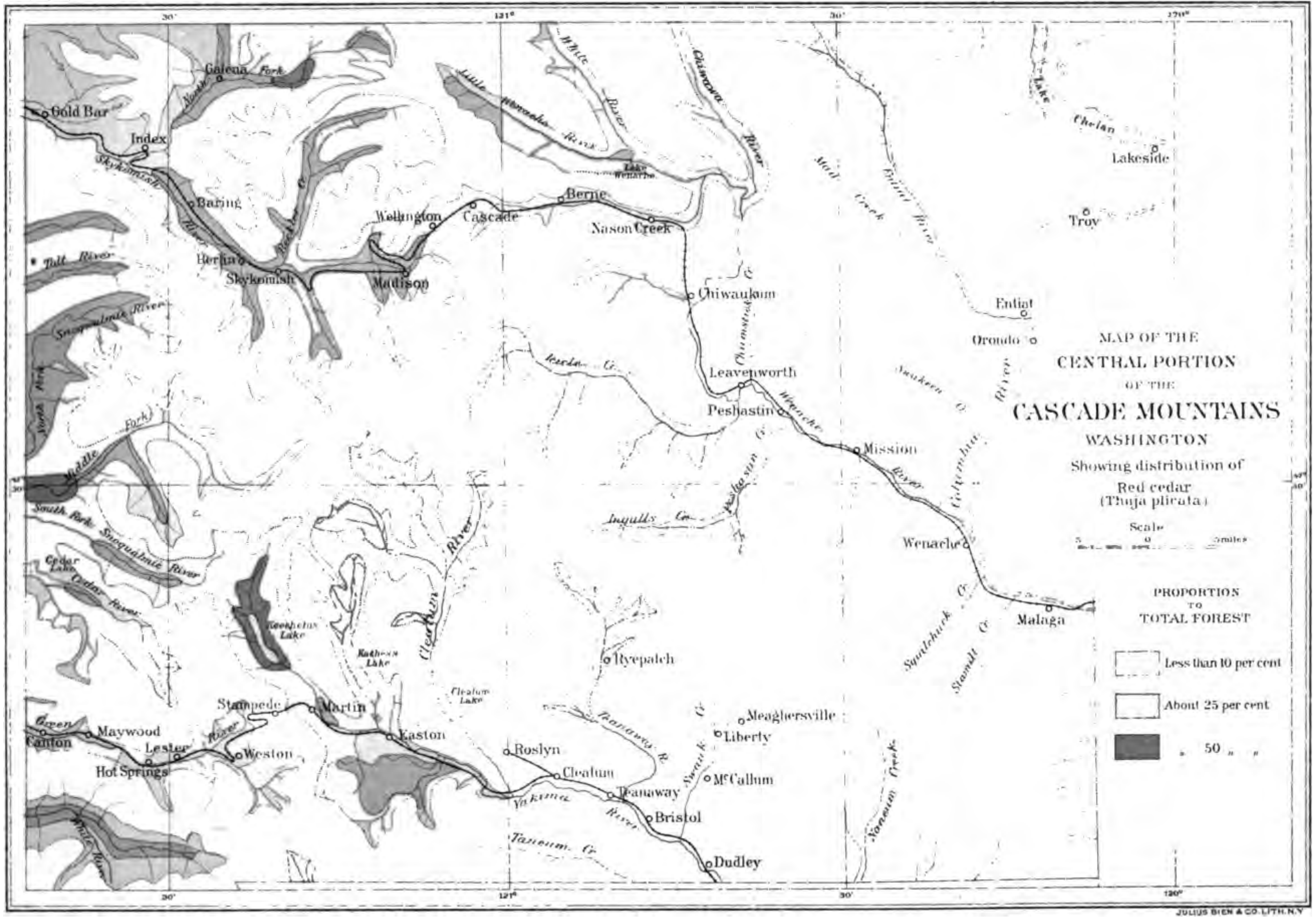
DEFECTS AND DISEASES OF TIMBER TREES.

The forests of this region are, generally speaking, free from serious defects and disease. Those defects which exist are mostly attributable to old age, storms, and fire.

Trees, like every other product of nature, reach an age of maturity. When the life-giving sap no longer ascends to their topmost branches to impart new life and strength, there follows a period, varying in length according to location and exposure, when the tree, like ripened fruit, is at its best. Following this come the elements of disease or decay, and the work of destruction begins either at the center of the base or at the crest, which the sap has failed to reach. Usually it is the former cause, the heart decay beginning before the top has ceased to grow. Year after year the disintegration goes on until the heart wood is entirely destroyed; but the old shell remains standing for many years, protected from the winds by the surrounding trees.

This is the condition that prevails among the red firs (*Pseudotsuga taxifolia*), Mertens hemlock (*Tsuga mertensiana*), white fir (*Abies grandis*), and some other species of the lower zones where no burns have taken place. Numerous old trunks of this kind may be seen which appear like solid shafts, but an examination shows them to be thus defective. An estimate of a tract from which these are eliminated often materially reduces the amount of standing timber from what it appears to be at first glance.

In the canyons and on sheltered slopes the conditions as stated above are common, but in the alpine or subalpine zones the fierce storms usually destroy the



MAP OF THE
CENTRAL PORTION
OF THE
CASCADE MOUNTAINS
WASHINGTON
Showing distribution of
Red cedar
(Thuja plicata)

Scale
5 0 5 miles

PROPORTION
TO
TOTAL FOREST

- ☐ Less than 10 per cent
- ▨ About 25 per cent
- ■ " 50 " "

JULIUS BIEN & CO. LITH. N.Y.

trees when the trunks become materially weakened. In these zones the greatest defect is what is commonly called "wind shake." The lovely fir (*Abies amabilis*) and Patton hemlock (*Tsuga pattoniana*) are the most frequently injured, showing wide seams from their bases almost to their tops. The white pine (*Pinus monticola*), being soft and flexible, does not suffer materially from this cause. Heart shake is common among the red fir.

Surface fires creep through the forests of yellow pine (*Pinus ponderosa*), burning the humus and litter, frequently running up the trees and igniting the resin which exudes from the trunk or base of the limbs. This results in cavities at the base and a loss to the logger of several feet of the "butt cut." Many complaints are made by lumbermen in the yellow-pine regions of loose black knots, which lower the grade and consequently the market value of a large percentage of the contents of a tree. The cause of this is not obvious, but it is probably due to the annual growth of the tree covering the cambium bark of the limb. When the limb dies by fire or is cast off by natural growth and the knots are covered over by successive layers of wood and bark, the cambium disintegrates from around the body of the incased limb, with the result that the limb becomes loosened from the main body of the tree. Shrinkage of the dead wood may be also a factor in this result.

Very little disease is apparent. Some mistletoe (*Arceuthobium*) was seen in the yellow-pine zone, on the yellow and lodgepole pines, but not in sufficient quantities to injure the trees. Lichen is mostly confined to dead trees in swampy localities.

On steep hillsides avalanches do much damage to timber by stripping off the bark or snapping off the trunks. Great weight of snow often tears the limbs from the trees, and water finding lodgment in the cavities causes decay.

MARKETS AND PRICES OF LUMBER.

Among the timber cruisers and lumbermen west of the summit of the Cascade Mountains the red fir, the red cedar, the spruce, and sometimes the hemlock are known as timber, and if a section of land is called a "timber section" it is understood that it supports a sufficient stand of one or more of these species to make it worth cutting. But logging is by no means confined to the species mentioned, for when a logging road or tramway is once laid into a section it is the practice to remove everything of merchantable value.

As the most extensive of the heaviest stands of timber are in the lower zone, below an altitude of 3,000 feet, and as these lower areas are the most accessible for logging, the species of trees there represented have become best known commercially, but the time is not far distant when the noble fir, lovely fir, hemlock, Alaska cedar, and others, desirable for one purpose or another, will be favorably received in the market. Modern logging machinery and methods, as applied by skilled labor, have reduced the "inaccessible" areas to a minimum, and it may be truly said that no forest of desirable trees is beyond the possibility of attack.

Aside from a very small local consumption, all the timber of the western slope is tributary to the Puget Sound ports, for either the domestic or the foreign trade, both of which are steadily increasing.

The current market prices (December, 1900) show a slight increase from a year ago, and the few following prices on red fir are given for information:

Prices of lumber in Washington.

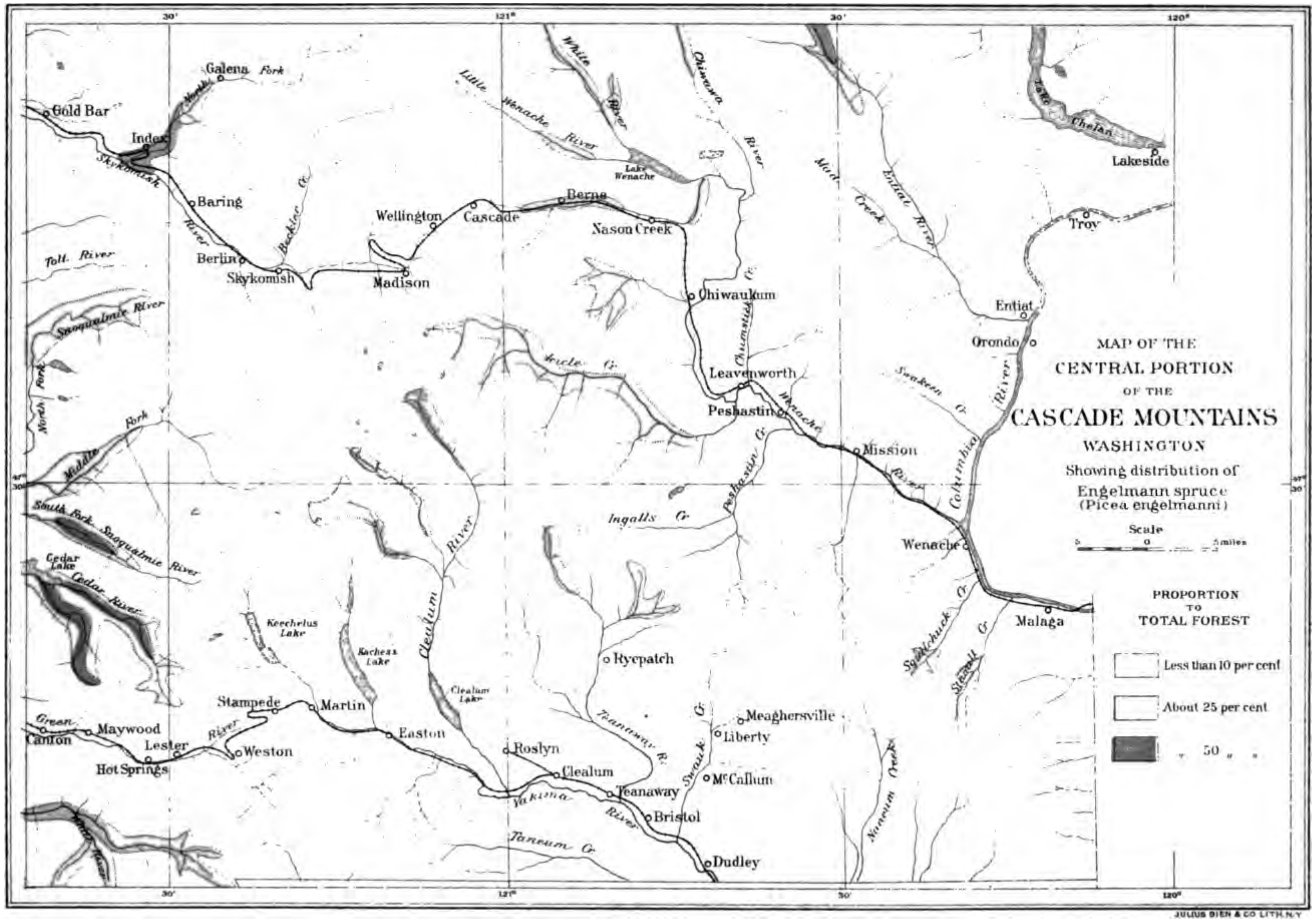
Grade.	Size.	Finish.	Per 1,000 feet B. M. at—	
			Seattle or Tacoma.	North Yakima.
Common	1 by 12 inches	Rough	$7.50	$13.50
Common	1 by 12 inches	Surfaced two sides	10.50	16.50
Flooring V. G. No. 1	1 by 4 inches	Dressed and matched	20.00	25.50
Flooring V. G. No. 2	1 by 4 inches	do	19.00	24.50
Ceiling No. 1	⅝ by 6 inches	Beaded or plain	15.40	19.00
Ceiling No. 2	⅝ by 6 inches	do	14.40	18.00
Wainscoating No. 1	⅝ by 4 inches		12.00	17.00
Wainscoating No. 2	⅝ by 4 inches		10.00	15.00
Shiplap, common	1 by 8 inches		8.50	14.50
Fencing No. 1	1 by 4 inches		8.00	15.00
Fencing No. 2	1 by 4 inches		7.00	14.00
Pickets	1 by 3 or 1¼ by 1¼ inches			
Lath	⅜ by 1½ inches by 4 feet		[a] 2.00	[a] 3.00

[a] Per 1,000.

The prices on large or long timbers remain the same as given in my report on the Mount Rainier Forest Reserve.

East of the summit of the Cascade Mountains yellow pine (*Pinus ponderosa*) comprises about 85 per cent of the total output of timber for economic uses. Fifteen sawmills are located on the eastern slope, and these are mostly small plants operated during the summer season to supply the local demand. This includes the materials for the construction of irrigation flumes and fences and for the manufacture of fruit boxes and crates to supply the demands of the enormous fruit-growing industries of the Yakima, Wenache, Entiat, and Chelan valleys.

Red fir is cut where obtainable and used for various building purposes, but the wood is inferior to the soft growth of the moist western slope, being harder and much more brittle. According to a section foreman, railroad ties cut from red fir growing at high altitudes or on the eastern slope will last two years longer than



MAP OF THE
CENTRAL PORTION
OF THE
CASCADE MOUNTAINS
WASHINGTON
Showing distribution of
Engelmann spruce
(Picea engelmanni)

JULIUS BIEN & CO. LITH. N.Y.

those cut from Puget Sound timber. Large amounts of red fir and yellow pine are cut for cord wood, and when contiguous to railroads are shipped to interior towns. During construction work on the Northern Pacific and Great Northern railways some yellow pine, lovely fir, tamarack, Engelmann spruce, and red cedar were cut for bridge timbers and ties, but the total amount is insignificant. Some ties of red cedar are used by the Great Northern Railway; and although they resist decay, they do not hold the spikes well and are therefore not as desirable as those made of tamarack or red fir.

The market prices of yellow-pine lumber which prevail throughout this region are as follows:

Prices of yellow-pine lumber in central Washington.

Clear, rough No. 1	per M feet B. M.	$16.00 to $18.00
Clear, rough No. 2	do.	12.00 to 14.00
Clear, rough No. 3	do.	8.00
Cord wood	per cord f. o. b.	2.25 to 2.50

On Squillchuck Creek near Wenache a small plant has been established for the purpose of manufacturing wooden irrigation pipe. This is done by sawing out the center of the sticks, which are from 6 to 12 inches in diameter and 10 feet in length. One end of the pipe thus made is tapered, and the other end is reamed out to form a bell to receive the tapered end of the adjoining pipe. The pipe is laid underground and is claimed to be long lived. Yellow pine is preferred for this purpose, and the core of heartwood taken from the stick is used for fence pickets. If successful, this plant will be of great value to the farmers of that vicinity.

DETAILED DESCRIPTIONS OF AREAS.

SKYKOMISH RIVER WATERSHED.

Prospecting and development work has progressed to a considerable extent and over large areas of this watershed, more particularly on the North Fork and its tributaries and on Miller River and Money Creek. The Great Northern Railway follows the main valley to Stevens Pass, where a tunnel recently constructed passes under the summit, and the valley has thus been opened and its resources made tributary to points both east and west.

Sawmills are in operation at Skykomish, Berlin, Baring, Index, and Gold Bar, all the finished lumber being shipped by rail excepting that for the small local demand at Skykomish and Index. The Skykomish River is drivable, and along its banks considerable cutting has been done, principally of cedar shingle bolts. This culling of individual trees at most accessible locations does not make a logged area, or necessarily precede the clearing of the bottom land for cultivation, but when clearings are made for that purpose the timber is not wasted. Although 15,000 acres of this valley are good agricultural land, only 90 acres are in cultivation.

Areas logged clean are often used for wild pasturage, as the rich soil of these bottoms supports a good growth of grasses and weeds upon which stock do well. In such areas the stumps of trees and the stubble of young growth are generally left to rot until burned or grubbed out to prepare the surface for the plow. The clearing of such land is worth $100 to $150 per acre, and there is little or nothing saved by waiting ten years, or even a lifetime, before removing the stumps. The stump of a newly cut tree burns better than a rotten one, or is lifted and split more thoroughly if powder be used. It means hard work in any case, and the pioneer in such areas earns all that he gets and generally more.

The land-classification map accompanying this report (Pl. I, in pocket) shows the location of the burns. The fact that a line of burned areas closely follows the alignment of the Great Northern Railway strongly suggests that they originated from the construction and operation of the road. Details of dates and circumstances were not obtainable, for railroad men are of a roving disposition and none were met who had been there long enough to give any information. Other burns in this watershed, including those near Cady Pass, have spread from the fires of prospectors and campers.

The principal timber trees are the red fir, red cedar, and hemlock. White fir and Engelmann spruce are also found in considerable quantities in the valley bottoms. Lovely fir has a wide distribution in this watershed and is an important tree in the middle zones. White pine is represented in the mixed forests, but does not make a strong showing in battle with the firs and cedars.

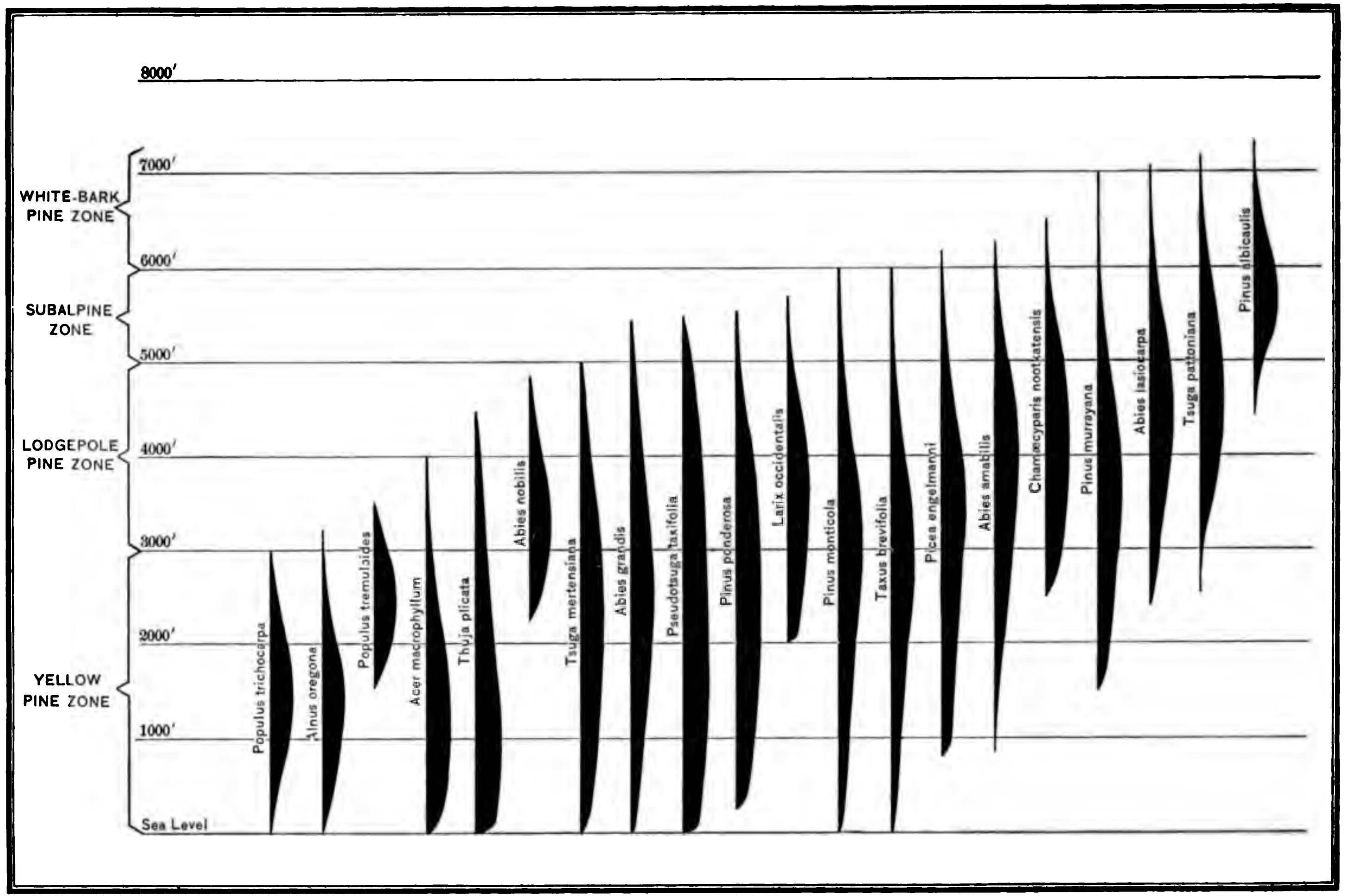
Proportions and amounts of timber species in Skykomish River watershed.

Species.	Per cent.	Estimated B. M.
Red fir	35	1,127,393,750
Mertens hemlock	35	1,127,393,750
Red cedar	10	322,112,500
Lovely fir	10	322,112,500
White fir	3	96,633,750
Engelmann spruce	2	64,422,500
Subalpine fir Patton hemlock White-bark pine	5	161,056,250
Total	100	3,221,125,000

TOLT RIVER WATERSHED.

That portion of the Tolt watershed lying in ranges 9 and 10 east is covered by an unbroken forest of hemlock, red fir, red cedar, lovely fir, and some white pine.

This area is not traversed by any of the traveled routes across the Cascade Mountains, and this, together with the fact that it offers little to the prospector and



ALTITUDINAL RANGE AND DEVELOPMENT OF TIMBER TREE SPECIES.

nothing to the stockman, has given it immunity from the destruction likely to follow the advent of man. The stream is not drivable, but the timber will be quite accessible for skid roads and will find an easy outlet westward down the river valley.

Proportions and amounts of timber species in Tolt River watershed.

Species.	Per cent.	Estimated B. M.
Red fir	35	106,333,500
Mertens hemlock	35	106,333,500
Red cedar	10	30,381,000
Lovely fir	10	30,381,000
White pine	5	15,190,500
White fir Subalpine fir Patton hemlock	5	15,190,500
Total	100	303,810,000

SNOQUALMIE RIVER WATERSHED.

Three branches of the Snoqualmie, known as the North Fork, Middle Fork, and South Fork, drain this watershed. The two last mentioned rise in the main range of the Cascade Mountains, being separated from each other by a spur of the main range which ends in Grouse Ridge.

A wagon road follows the South Fork to Snoqualmie Pass, thence into the Yakima watershed, and it is along or near this route that the forests of the Snoqualmie watershed have suffered by fire. The large burn on Denny Mountain was first fired in 1865, and in 1894 a second fire destroyed much of the restocking and included new areas of the forest. The destruction has been almost complete, and there is no immediate danger of a third fire in this area, as there is nothing to burn. Judging from the position of this area, these fires occurred during long and steady north winds, which prevented their spreading over the crest of the hills into Pratt Creek Valley, and at the same time were not severe enough to cross the damp lands of the river bottom to the southward. On Teneriffe Peak the southern slope has been fired several times since 1893, and the area of timber destroyed extends more than 4 miles westward outside of the limits of the area mapped, and includes Mount Si, near the town of North Bend.

The nearest sawmill is near North Bend, 4 miles west of Grouse Ridge. Logging operations on an extensive scale were contemplated in T. 23 N., R. 9 E., but the plans have not yet matured. The streams are drivable for the greater part of the year.

These three forks of the Snoqualmie unite in T. 24 N., R. 8 E., about 3 miles above the falls where the plant of the Snoqualmie Falls Power Company is located. This plant supplies the cities of Tacoma and Seattle with electric power and light, over wires with a transmission of 30,000 volts. The falls are 270 feet in height, and at the minimum flow of the river give 30,000 horsepower, of which 14,000 horsepower is now developed. As the supply of the river is derived mainly from the melting of ice and snow in the mountains, the importance to the Puget Sound cities of protecting this watershed is apparent.

Considering the entire watershed, red fir and hemlock predominate, forming two-thirds of the timber. In the North Fork Basin there is an unusually heavy stand of hemlock, which, if considered with similar areas in the Skykomish watershed (shown on Pl. IV), shows a broken belt of hemlock extending southwesterly from Chusallie Pass. In the Middle Fork Basin red cedar forms large percentages of the forest, but only over small areas. A peculiar feature of its forests is that the narrow strip of sandy bottom land along the upper valley is timbered with hemlock, while the red cedars and red firs have their best development upon the adjacent hillsides, which are so moist as to support a luxuriant growth of ferns, mosses, and devil's club (*Echinopanax horridum*). The South Fork also has a distinguishing feature in the high percentage of Engelmann spruce, which for a distance of 6 miles along the river benches has developed to an extent equaled only in the Cedar River Valley.

Arable and cultivated lands in Snoqualmie watershed.

Portion of watershed.	Acres arable land.	Acres cultivated land.
North Fork Valley	2,500	18
Middle Fork Valley	5,000	146
South Fork Valley	1,500	113
Total	9,000	277

Proportions and amounts of timber species in Snoqualmie watershed.

Species.	Per cent.	Estimated B. M.
Red fir	35	779,012,500
Mertens hemlock	30	667,725,000
Red cedar	10	222,575,000
Lovely fir	10	222,575,000
Engelmann spruce	7	155,802,500
White pine	3	66,772,500
White fir Noble fir Subalpine fir Patton hemlock White-bark pine	5	111,287,500
Total	100	2,225,750,000

CEDAR RIVER WATERSHED.

It is from this watershed that the city of Seattle draws its water supply for domestic, manufacturing, and municipal purposes. Its area is only 62,500 acres, but its location in a belt of abnormal precipitation insures an abundant supply at all seasons of the year. It is bounded on the north and east by high peaks, fairly timbered, and in their present condition capable of holding the snows well into the dry season. The slopes south of the river are less abrupt, and, being more protected from the sun's rays and the warm Chinook winds, will assist in giving the slow drainage desired to keep up the flow during the summer months.

The preservation of the heavy forests of the valley lands has been remarkable, for the evidences of small fires started by pleasure seekers, fishermen, and campers are numerous, but in every case the fires have failed to spread. The small burns in this watershed were upon the hillsides and occurred in small timber.

The moist valley lands are the home of the Engelmann spruce, red cedar, white pine, and white fir, which, added to the ever-present and predominating red fir and hemlock, give a mixed forest of unusual interest and beauty. It is entitled to the protection which its commercial importance demands.

The arable lands of Cedar River Valley have an extent of 1,000 acres, of which 24 acres have been in cultivation, but are now abandoned. Not a living man, beast, or bird was seen or heard during the four days spent there. The silence prevailing in this valley was very noticeable as compared with other portions of the Washington forests over which my observations have extended, for there is rarely a day that one may not hear the chatter of the squirrel, the stroke of a woodpecker, or the drum of a pheasant, or see the signs of bear, cougar, or deer. I have learned from others who have visited this valley that their experiences confirm the above.

Proportions and amounts of timber species in Cedar River watershed.

Species.	Per cent.	Estimated B. M.
Red fir	40	194,520,000
Mertens hemlock	30	145,890,000
Engelmann spruce	10	48,630,000
Red cedar	5	24,315,000
Lovely fir	5	24,315,000
White pine	3	14,589,000
White fir	2	9,726,000
Noble fir	5	24,315,000
Subalpine fir		
Patton hemlock		
White-bark pine		
Total	100	486,300,000

GREEN RIVER WATERSHED.

The area drained by Green River, comprising 95,500 acres, shows more evidences of extensive burns, both early and recent, than any other watershed examined. Seventeen thousand acres, or about 18 per cent of the total watershed, must be classified as "burned," as the restocking is still in the sapling state, and of no merchantable value.

The first of the destructive fires occurred about thirty-five years ago, as indicated by individual red firs, hemlocks, and Engelmann spruces of that age which survived later fires. In the vicinity of Hot Springs the underbrush and second growth has been destroyed by fire several times during the last twelve years, and the oldest second growth now showing upon the hillsides is 17 years old. The standing dead snags of the former old growth are of no value. In the bottom or adjacent slopes of the canyon are several small patches of the original forest, in which the growth is thrifty, although the trunks are scorched to a height of 50 feet or more.

During the last ten years three sawmills and two hotels have been destroyed by fire.

A mill in sec. 13, T. 20 N., R. 9 E., cut considerable good timber for local use, and at Lester a mill has cut the timber on about 160 acres for lumber. The remainder of the cutting in this valley has been done by mills since removed or destroyed, and includes an area of 300 acres at Hot Springs, which was cut for local consumption.

About 3,500 acres of bottom land in the Green River Valley may be called arable, but of this at least 80 per cent is of very poor quality. Volcanic rocks predominate in the form of ledges and large bowlders, and render the valley uninviting. The entire cultivated area is only 5 acres, but clover started near Hot Springs has spread over 150 acres of the cut area and made a successful stand against the native weeds.

Proportions and amounts of timber species in Green River watershed.

Species	Per cent.	Estimated B. M.
Red fir	45	168,356,250
Mertens hemlock	30	112,237,500
Red cedar	5	18,706,250
Lovely fir	5	18,706,250
White fir	5	18,706,250
White pine	3	11,223,750
Noble fir	2	7,482,500
Subalpine fir	5	18,706,250
Patton hemlock		
Alaska cedar		
White-bark pine		
Total	100	374,125,000

WHITE RIVER WATERSHED.

The main forks of White River are supplied by the glaciers and snow fields on the northeast side of Mount Rainier. One of its principal nonglacial tributaries is the Greenwater, which heads in the Cascade Mountains and is within the limits of the examined area.

The old Naches Pass trail, which, prior to the construction of the Northern Pacific Railway, was a well-traveled route from eastern Washington to Puget Sound, follows the Greenwater to the summit. Northward from a favorite camping place at the mouth of the Greenwater is an extensive burn, joining and probably synchronous with the large burn of the Green River Valley, which may thus be traced to campers and packers as well as to the right-of-way clearing of the Northern Pacific Railway. At and near Naches Pass, which is one day's travel from the mouth of Greenwater and a camping place, are several smaller burns in light timber.

The heavy timber of the bottom lands is red fir, red cedar, hemlock, and Engelmann spruce; on the hillsides there is noble fir, lovely fir, white fir, white pine, and Alaska cedar. Four thousand acres of the bottom lands may be classed as arable, as the soil is rich and deep, well watered, and less than 2,000 feet above the sea, but the clearing of this land for the plow will be so expensive as to be prohibitive for some time to come.

Proportions and amounts of timber species in White River watershed.

Species.	Per cent.	Estimated B. M.
Red fir	40	291,780,000
Red cedar	15	109,417,500
Mertens hemlock	15	109,417,500
Engelmann spruce	10	72,945,000
White pine	5	36,472,500
Lovely fir	5	36,472,500
Noble fir	3	21,883,500
White fir	2	14,589,000
Subalpine fir	5	36,472,500
Lodgepole pine		
Patton hemlock		
Alaska cedar		
White-bark pine		
Total	100	729,450,000

YAKIMA RIVER WATERSHED.

The principal tributaries of Yakima River are the Kachess, Clealum, Teanaway, Swauk, Taneum, and the Naneum. By the accepted nomenclature the main Yakima River heads near Snoqualmie Pass and runs through Keechelus Lake; but the Clealum is the longer and larger stream.

The Snoqualmie Pass wagon road follows up the main Yakima Valley, past Keechelus Lake and over the summit, on a route which has been traveled for forty years. Considering this the examinations show a remarkably small proportion of burned area as compared with the regions lying immediately eastward, but the numerous small burns in the vicinity of Keechelus Lake prove that campers and packers were not overly careful, and also suggest, what observation shows to be a fact, that the local conditions of humidity are not favorable to the spreading of forest fires. The Keechelus Basin, lying east of the summit of the Cascades and paralleling it, is in what may be termed the "overlap," and shares the characteristics of the forests of both the eastern and western slopes, excepting only the open yellow-pine forests of the lower eastern slopes. The forests are very "spotted," and any of the species represented may predominate over a small area, and the general forest is very mixed as to species. Several of the small burns mentioned occurred in July, 1865, and about the same time fire spread over considerable areas of Goat Mountain, south of the town of Easton. The year 1890 was a fruitful year for burns, several of which were in the young trees that had restocked previous burns.

Above Keechelus Lake, more particularly on Gold Creek, there has been considerable prospecting for mineral.

In the Kachess watershed, immediately eastward, the burns are of greater extent, and in the Clealum watershed, still farther east and within an area which has been both sheeped and prospected, fires have done great damage in both light and heavy timber. The large burned area shown on the map at the headwaters of the Clealum and the Big Salmon Lasac rivers is the result of three fires, in 1888, 1895, and 1898. A few scattered areas of the first burn were not refired during the later burns and show a scanty restocking of lodgepole pine, but the remainder of this entire burn presents a scene of desolation not equaled on the eastern slope. In the vicinity of Wapatos Lake the fires burned so deep into the soil as to absolutely destroy all vegetable matter, leaving only a clean surface of baked soil which will require a lifetime for nature to restock with timber. During the last season some fireweed (*Epilobium angustifolium*) and a few other weeds have preempted claims which they alone can hold, but not a coniferous sapling is to be seen except along the borders of the standing forests where the humus was not utterly destroyed.

From an inspection of the unharmed areas of old growth bordering this burn it is assumed that the destroyed forest was of red fir, white pine, Alaska cedar, and lovely fir. Near the head of the Big Salmon Lasac the Alaska cedar reached a high state of development, comprising at least 40 per cent of the forest. The board measure per acre of Alaska cedar never runs high, but the wood is the most valuable of the Washington woods, and this burn beyond doubt destroyed much of it.

Southward from the area just described the country is scarred by dozens of burns, large and small, with outlines regular or irregular according to the conditions of exposure, the action of the winds, and the nature of the forest destroyed. Details regarding these were not obtainable, only the general statement that hardly a year has passed since 1865 but fire has burned or reburned some area. Some of the restocking would indicate that the date might be set back to 1860. To the southward of Yakima River the tamarack has been the principal reclaimer of large areas, but in the restocked areas north of the main Yakima the conditions are varied, consistent with the very mixed bordering forests, from which a high wind may distribute the fertile seeds of the species when matured.

The Teanaway country, together with the Taneum and all the favorable and accessible areas eastward, has been plentifully sheeped. The forests are generally open, with very little forest litter, and are well watered. The lower country is well and permanently settled by industrious people, who appreciate the value of every little stream which may be diverted to make the naturally rich, but dry, soil productive and who deplore the existence of even the few burns which seem so insignificant when compared with those formerly described. The burns in this watershed as mapped will be a startling exposé of a threatening danger to the most important drainage basin in the State of Washington, so far as water supply for irrigation is concerned.

About 22,000 acres of this watershed have been logged, and of this area 5,258 acres are in cultivation. Mills have been operated at Easton, Big Creek, Roslyn, Clealum, Teanaway, Marysville, and in sec. 14, T. 20 N., R. 16 E. The mill at Marysville has a capacity of only 4,000 feet per day and supplies the local demand for the building of mining flumes and sluices. Along Swauk River the cutting has been mainly for mining timbers, used in the placer diggings, which have been in operation for the last twenty years. Yellow pine predominates in this region, but is not considered as desirable for mining purposes as red fir. The same is true at the coal mines at Roslyn and at Clealum, but at these points the local demand for building lumber is considerable.

Sixty-seven thousand acres are arable, and the location is better indicated on the map submitted herewith than it could be by a description. This estimate refers only to that portion of the Yakima watershed lying within the area examined. The estimates of the available lands lying outside, but which are largely dependent upon the upper watershed for water supply, are given under the heading "Irrigation."

Proportions and amounts of timber species in Yakima River watershed.

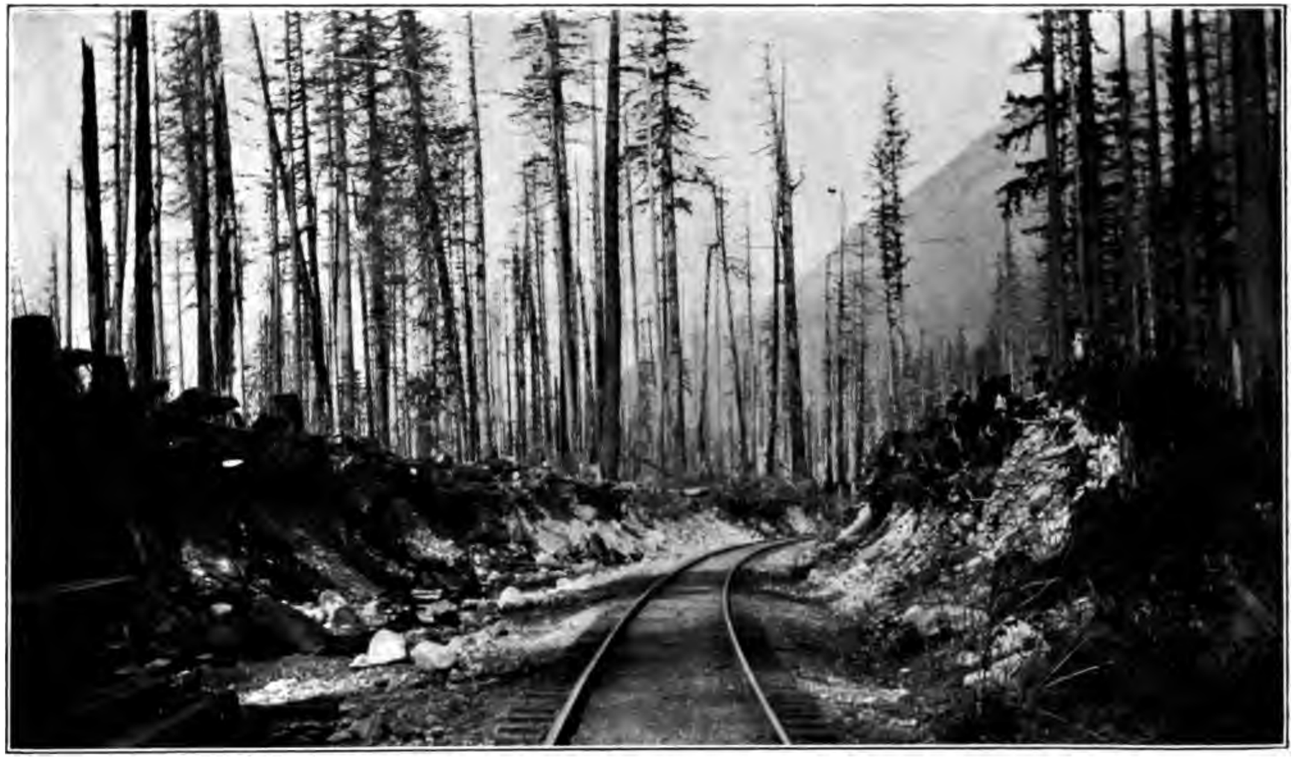
Species.	Per cent.	Estimated B. M.
Yellow pine	50	1,305,250,000
Red fir	20	522,100,000
Mertens hemlock	10	261,050,000
Red cedar	5	130,525,000
Tamarack	5	130,525,000
Lovely fir	3	78,315,000
White fir	2	52,210,000
Engelmann spruce	5	130,525,000
White pine		
Noble fir		
Subalpine fir		
Lodgepole pine		
Patton hemlock		
Alaska cedar		
White-bark pine		
Total	100	2,610,500,000

WENACHE RIVER WATERSHED.

The important tributaries of the Wenache River are the Little Wenache, White, Nason, Icicle, Chiwawa, and Peshastin.

The Little Wenache enters Lake Wenache through a wide bottom densely covered with a growth of deciduous underbrush and trees, the latter mainly willow, alder, and maple. In the upper basin is a fine forest of old-growth red fir, red cedar, white pine, and hemlock, besides a smaller growth of lovely fir. Some trees in this old growth have a diameter of 4 to 5 feet and make up a forest, such as is seldom seen in eastern Washington. This body of mixed growth extends along the river about 5 miles. Between it and the white-bark-pine zone the hemlock and lovely fir exclude all other species, except an occasional individual of the species named. At the forks of the Little Wenache a terrific fire has burned along the main stream and a distance of 4 miles up the South Fork, destroying millions of feet of timber, including some of the best cedar in the canyon. Doubtless this fire started from an old trapper's cabin. A smaller and less destructive fire, about 4 miles east of Cady Pass, was traceable to a campfire built on the trail which leads across the summit.

The forests of the Little Wenache are such as would delight the heart of the forest lover, and it is to be regretted that the Washington Forest Reserve does not include this watershed, or that protection of it is not assured from the destruction which is sure to follow the coming of summer campers to this delightful region.



BURN NEAR BERLIN, ON GREAT NORTHERN RAILWAY.

White River also flows into Lake Wenache. Its valley has been a favorite hunting ground for the Indians, as deer, goats, beaver, and smaller game were plentiful, and huckleberries were abundant on the hillsides which had been burned over many years before. About 2,000 acres of this valley is "beaver-dam" land and if cleared might be rated as agricultural, but its high elevation and position in relation to the mountains make this classification doubtful, and this area has not been included in estimating the arable lands of the Wenache watershed. It will, however, add to the value of this region for grazing purposes, as in its wild state it supports a rank growth of forage grasses. The evidences of very old burns are numerous, but restocking is well advanced. The causes of these old burns must be assigned to the Indians.

Nason Creek, before the advent of the Great Northern Railway, bore much good timber, but fires set to clear the right of way during construction work spread over considerable areas of the valley and adjacent hills, and these, together with the cutting for railroad uses, have greatly reduced the amount of standing timber. The best timber of the upper basin was found in the vicinity of the Cascade tunnel, and consisted of lovely fir, Patton hemlock, and Engelmann spruce, with some red cedar. Near Nason Creek station a mill having a daily capacity of 10,000 feet is in operation, and ships lumber to Wenache. Between this point and Merritt are about 300 acres of good hay land, but at an altitude which insures frosts every month of the year. The same is true of 250 acres lying beween the mouth of the creek and the point where the railroad leaves the creek.

The pass through which the railroad runs via Skeeney Creek contains some good pine timber, but much of the best has been culled for saw logs and cord wood. Large quantities of cord wood are shipped to the timberless areas of central Washington.

Icicle Creek, from a point 3 miles above its junction with the Wenache, flows through a narrow canyon with walls rising in places 5,000 feet on either side. Its watershed is an irregular triangle bounded by the main divide of the Cascades on the west, the Mount Stuart divide on the south, and the Chiwaukum Mountains on the northeast. These three snow-capped ranges compel an increased humidity and frequent storms during the summer season, which, together with melting snows, maintain a large and constant waterflow. Owing to the abnormal precipitation and the general inaccessibility of the watershed few burns have occurred and these are of small extent. The arable lands of Icicle Valley are at the mouth of the creek, where the bottom widens to join that of Wenache River, and have an area of about 1,200 acres, of which only one-third is good, the remainder being rocky. Excepting this tract the soil formation of the watershed consists principally of rock in the form of ledges and bowlders, owing to the wide range of altitude; nevertheless, the valley supports a varied growth of the forest trees. All of the coniferous timber trees were found, excepting the noble fir (*Abies nobilis*), and it is very probable that this species is represented by some individuals, as its northern limit of distribution is at least latitude 48°. Here was found the woolly larch (*Larix lyallii*).

The Chiwawa Valley, below the Washington Forest Reserve, varies in width from a half to three-fourths of a mile. The soil in the upper portion, near the reserve, is scoria sand and decomposed pumice overlying a deposit of gravel and bowlders, hence it is of very poor quality and utterly unfit for cultivation. It is the home of the lodgepole pine, which claims the entire bottom and extends far up on the hillsides of the western slope. The canyon is fairly well timbered, but the trees are mostly small or saplings. Many years ago extensive fires swept over this region, and these areas were reclaimed by the lodgepole pine assisted by the red fir, white fir, and the yellow pine in the more favored localities. Between Fish Lake and the Chiwawa is a dense growth of mixed species, including white pine. Some of this land, if cleared, would be fair agricultural land, but altitude and location are unfavorable, and the natural classification of the watershed is grazing land.

On Peshastin Creek headwaters the forest cover is mainly a young growth of tamarack which many years ago reclaimed a large burned area. Outside of this the yellow pine prevails, with some red fir and white fir and tamarack. The soil is rocky and extremely shallow throughout the canyon, and the only arable land in the watershed is at the mouth of the creek and at a point called Camas Land. Aside from its value as grazing land, which this watershed shares with almost every watershed on the eastern slope of the mountains, its value as mineral land has to some extent been demonstrated, and it follows that the timber, although of small size, already has a value for mining purposes. At Blewitt a 20-stamp mill handles the output of the mines, and a large number of tunnels have been driven into the mountains, all of which require more or less timber. Large numbers of poles have been cut in distant burns along the tops of the hills and slid down the mountains to the works. These are mostly tamarack, averaging 9 inches in diameter at the stump. In a short time this section will be denuded of serviceable timber and the young growth of the canyons will be utilized.

In addition to the descriptions of the main tributaries as above given, there remains to be described the main Wenache Valley. From Leavenworth to Columbia River, a distance of 25 miles, this valley, together with large areas of its adjoining slopes, is arable and well situated for agricultural purposes and for irrigation. Out of a total of 48,000 acres of arable land, 5,565 acres are in cultivation, and the fertility is therefore demonstrated.

Forty years ago the first white settlers came to this valley and engaged in stock raising, trading, and packing. Near the mouth of the river some of the small

A. RED FIR ON GREAT NORTHERN RAILWAY.

B. FOREST ON NORTHERN PACIFIC RAILWAY.

tributaries were diverted to irrigate garden patches, and since that time settlement has increased slowly but steadily. Before the building of the Great Northern Railway this region was approached by a road leading over the Wenache Mountains, or in part by Columbia River, for the Wenache itself is not navigable except for canoes, and then not at low water. Although the railroad has made the markets more accessible, and has stimulated industry to a considerable extent, still the increase in cultivated lands since the railway was built is not over 20 per cent of the total.

Proportions and amounts of timber species in Wenache River watershed.

Species.	Per cent.	Estimated B. M.
Yellow pine	65	1,019,850,000
Red fir	20	313,800,000
Tamarack	5	78,450,000
Red cedar	3	47,070,000
White fir	2	31,380,000
Engelmann spruce	5	78,450,000
Mertens hemlock		
White pine		
Lovely fir		
Noble fir		
Subalpine fir		
Lodgepole pine		
Patton hemlock		
Alaska cedar		
White-bark pine		
Total	100	1,569,000,000

ENTIAT RIVER WATERSHED.

Entiat River flows through a deep canyon varying from a narrow gorge to a half mile in width. This canyon is settled to the northern line of township 27 north, a distance of about 20 miles, but many of the locations are abandoned the greater part of the year. Hay and cattle are the principal products of the upper valley. For a distance of 4 miles upstream from the mouth of the Entiat there is no timber, and in this region hay and fruit are the most important products. Fruit of an excellent quality is produced in abundance, and finds its local market at Wenache via the small steamers which ply Columbia River. From Wenache the distribution is made by the Great Northern Railway to points both east and west.

Irrigation is required for all crops. The soil is mostly light sand and decomposed country rock, and varies in depth from a few inches to 20 feet, with some fine black loam in the basins of the upper valley. Beds of washed gravel and rock occupy much of the surface, and in the vicinity of Lake Creek showers of scoria have covered the ground to a depth of a foot or more.

The upper basins are covered by a dense growth of birch, quaking aspen, willows, and other shrubs, which have formed a deep vegetable mold. Of this land there is not more than 300 acres. In the entire valley there are 516 acres in cultivation, most of which is in the timberless area near the mouth of the river, where about 1,000 acres are under irrigation ditches. The amount of arable land in the valley is estimated at 4,900 acres.

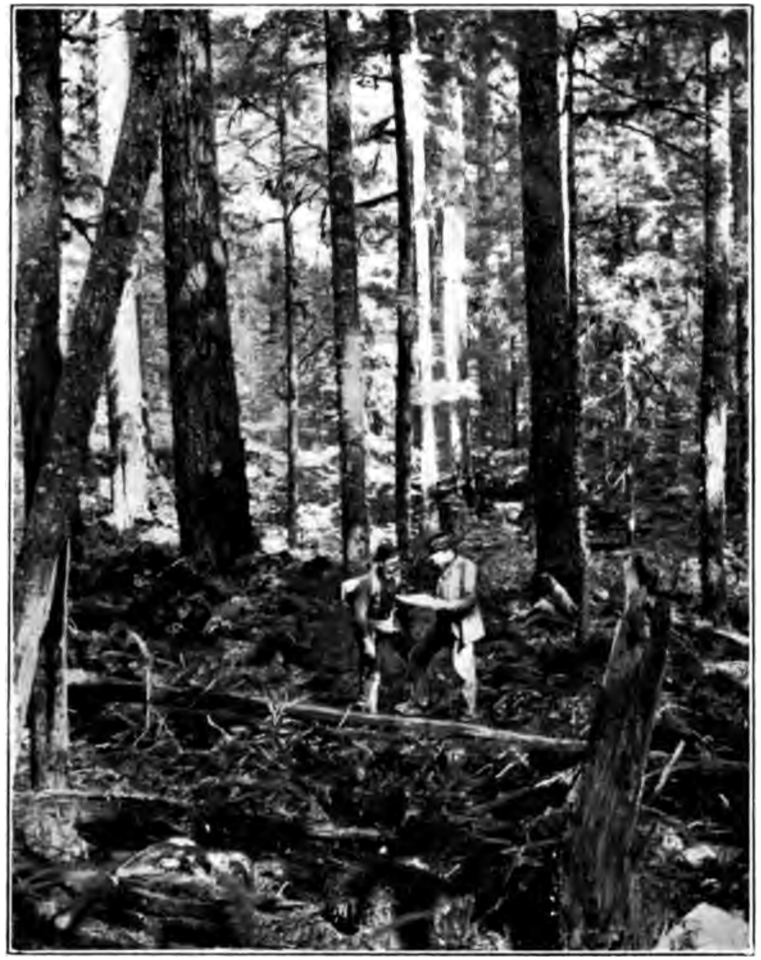
Below the subalpine zone the timber consists of 90 per cent yellow pine, with some red fir, and in the moist places with white fir, Engelmann spruce, and occasionally white pine above 2,000 feet.

On the high divides between Entiat and Mad rivers extensive burns occurred years ago, and the very life was burned out of the soil, leaving it poor indeed. Here the lodgepole pine has demonstrated its wonderful restocking properties, and hundreds of acres have been reclaimed where other trees could not find sufficient nourishment in the soil to promote growth. Large areas of saplings were found where they grew like grain in a field—as many as forty to the square yard—varying from one-half inch to 4 inches in diameter and from 5 to 30 years in age. While this pine is an active reclaimer it is, unfortunately, short lived, and as a result the ground is sometimes covered to a depth of 4 feet with dead trees. These are a constant menace to succeeding growth, but in time these accretions form a litter and humus sufficient to promote the growth of other species, and under this protection a forest cover of a more permanent nature results.

The subalpine fir prevails at the higher altitudes, and the white-bark pine covers the summits in its characteristic manner.

Lumbering has been carried on during the last nine years. Two mills have been constructed, one of which, a small plant built in 1899, has cut only a few thousand feet. The Entiat Lumber Mills have a capacity of 10,000 feet daily, and have cut about 3,500,000 feet under the present management. The logs for these mills are driven down the Entiat during the high stage of the river, which usually occurs in May. All the cutting has been done on the river banks or culled from the slopes immediately above. Where ground has been cleared for cultivation the logs have been purchased from the settlers. Driving is expensive and the demand for lumber is not brisk except for the manufacture of fruit boxes.

Frequent earthquake shocks of slight intensity are a feature of this section.



A HEAVY STAND OF RED FIR.

B HEMLOCK ON MIDDLE FORK OF SNOQUALMIE RIVER.

Proportions and amounts of timber species in Entiat River watershed.

Species.	Per cent.	Estimated B. M.
Yellow pine	75	277,462,500
Red fir	15	55,492,500
Lodgepole pine	5	18,497,500
Red cedar Engelmann spruce Mertens hemlock White pine White fir Noble fir Subalpine fir Patton hemlock White-bark pine	5	18,497,500
Total	100	369,950,000

LAKE CHELAN WATERSHED.

The major portion of Lake Chelan is within the Washington Forest Reserve, and north of township 28 north. The lower end of the lake extends into the great timberless area of eastern Washington, although the bordering hills are fairly well timbered. Yellow pine is the prevailing species, with some red fir on the hills above 2,500 feet. Most of the timber is small, ranging from 6 to 20 inches in diameter, and is seldom clear. In such a forest logging is simply a culling out of the best trees, the remainder being fit only for posts or fencing.

There is a sawmill at Lakeside which has been in operation about seven years, and has cut on an average 400,000 feet B. M. per annum. Under the same management a small portable mill will be operated in the newly settled basin north of Chelan. The two mills will have a capacity of 1,000,000 feet yearly, all of which will be for local consumption. Most of the logs are brought down from the head of the lake and are handled with very little waste.

Bordering the lower end of the lake is an area of about 27,000 acres of unusually fertile land. In striking contrast to the conditions prevailing in the lower areas of the Entiat and Wenache watersheds, this soil produces fine crops of fruit and grain without irrigation. Farms are cultivated more than 1,000 feet above the lake, where no running water is to be seen. The orchards make a remarkably quick growth and the fruit is of the finest quality.

Proportions and amounts of timber species in Lake Chelan watershed.

Species.	Per cent.	Estimated B. M.
Yellow pine	85	94,775,000
Red fir	10	11,150,000
Lodgepole pine	5	5,575,000
Subalpine fir		
Patton hemlock		
White-bark pine		
Total	100	111,500,000

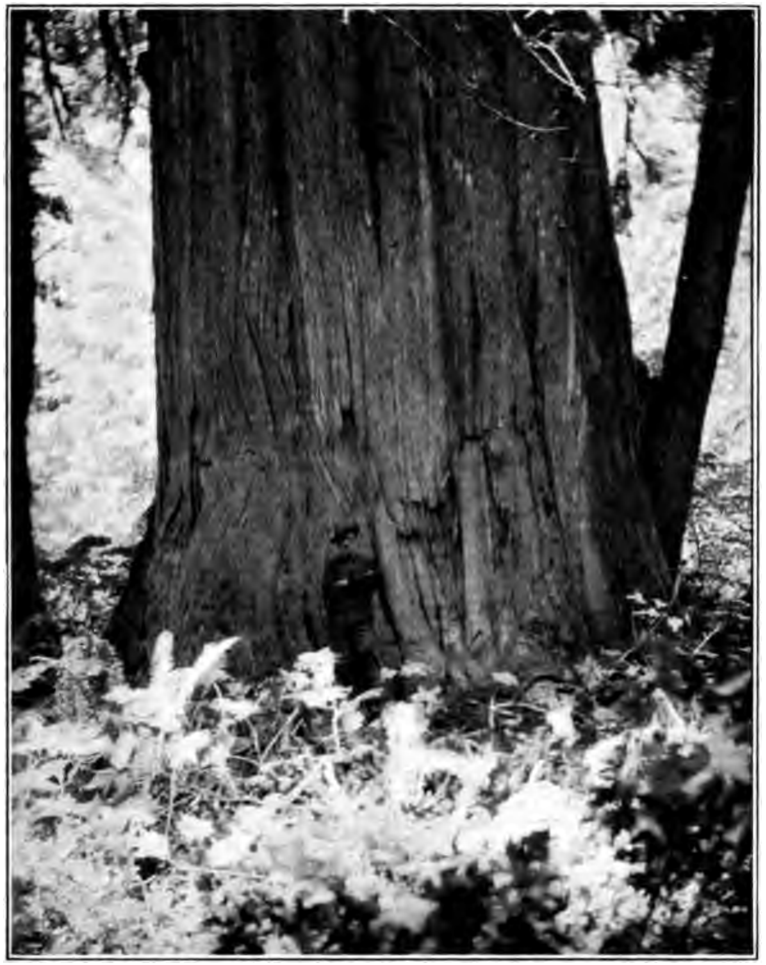
SUMMARY.

Stand of timber in central Washington.

Watershed.	Area.	Stand.	Average stand per acre.
	Acres.	*Feet B. M.*	*Feet B. M.*
Skykomish	364,800	3,221,125,000	8,800
Tolt	36,460	303,810,000	8,300
Snoqualmie	190,000	2,225,750,000	11,700
Cedar	56,100	486,300,000	8,700
Green	76,750	374,125,000	4,900
White	48,060	729,450,000	15,200
Yakima	570,000	2,610,500,000	4,600
Wenache	686,200	1,569,000,000	2,300
Entiat	175,500	369,950,000	2,100
Chelan	89,000	111,500,000	1,250
Total	2,292,870	12,001,510,000	5,230

Classification of lands in central Washington.

Watershed.	Total.	Logged.	Burned.	Timberless.	Timbered.	Arable.	Cultivated.	Irrigated.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Skykomish	389,000	850	21,500	1,850	364,800	15,000	90	....
Tolt	36,500	....	40	....	36,460	....	....	....
Snoqualmie	206,000	200	15,000	800	190,000	9,000	277	....
Cedar	62,500	....	5,500	900	56,100	1,000	24	....
Green	95,500	1,750	17,000	....	76,750	3,500	5	....
White	55,500	40	7,400	....	48,060	4,000	5	....
Yakima	754,000	22,000	85,000	77,000	570,000	67,000	5,258	1,700
Wenache	853,000	13,300	35,500	118,000	686,200	48,000	5,565	17,000
Entiat	212,000	1,000	15,500	20,000	175,500	4,900	516	1,000
Chelan	136,000	2,500	1,700	42,800	89,000	27,000	1,874	....
Total	2,800,000	41,640	204,140	261,350	2,292,870	179,400	13,614	19,700



A. RED CEDAR, 20 FEET IN DIAMETER.

B. HEMLOCK, MAPLE, AND ALDER.

Clealum, are well situated for the impounding of a reserve supply, and have areas and capacities as follows:

Areas and capacities of Lakes Keechelus, Kachess, and Clealum.

Lake.	Area.	Height of proposed dam.	Capacity.
	Acres.	*Feet.*	*Acre-feet.*
Keechelus	1,812	30	50,800
Kachess	3,968	30	91,000
Clealum	2,615	30	65,400
Total	8,395	....	207,200

This storage will furnish 1,200 cubic feet per second for 87 days, no allowance being made for evaporation or contingencies. It is confidently believed that this storage will be a safe insurance against any unusual season of drought.

From all the above it will be evident that the construction of these reservoirs and the preservation of their natural watersheds is imperative. This means that logging should be done under proper restrictions, and that the wanton destruction of the forests by fire must cease.

In the Wenache and Entiat watersheds the conditions are not so urgent. The areas which can be covered by gravity canals are small, and the supply is ample. At present the Wenache covers 17,000 acres of land, and feasible canals projected will increase this to 23,500 acres. The Entiat supplies about 1,000 acres.

GRAZING.

In the area treated in this report grazing is confined to the eastern slope. A few horses, most of which are Indian cayuses, range upon the bunch-grass hills near Columbia River. But few cattle are raised aside from those kept for domestic purposes.

Owing to the extreme roughness of a large portion of this area, cut and broken as it is by steep rocky ridges and precipitous canyon walls, sheep grazing is practicable only in certain limited tracts. As yet it is confined to the Yakima slope south of Clealum, the Teanaway and its tributaries, the high divide extending from Columbia River westward to Mount Stuart, the southern slope of Mount Stuart, and the Entiat and Mad River divides near the Washington Forest Reserve. Sheep are driven into this area from Yakima, Ellensburg, from east of the Columbia River, and even from Oregon.

The sheepmen complain of the range being overstocked. One owner declared that if some new pasture is not discovered the sheep will die in the hills.

Starting in the early spring, as soon as the lambing season is over, they leave the low hills along Columbia River and are driven toward the high mountains, which are reached soon after the winter snows have melted. Here they must remain until the fall rains have caused the grass to grow in the lowlands. Forage plants do not grow profusely in any of these sections. At the lower altitudes, among the pine woods, the pine grass (*Calamagrostis suksdorfi*) is the most important. Sheep do not relish this grass, eating it only when nothing else is to be found. They pass over this very rapidly, and large areas are required to keep them constantly in fresh pasture. One band was seen on the Middle Fork of the Teanaway where the hills were covered with this grass, but it seemed to be almost untouched. The sheep were gathered in the ravines, browsing upon wild cherry, hazel, and vine maple. In the grazing areas there is very little underbrush except in the moist canyons and ravines, which are often inaccessible. At the high altitudes, such as the divides running down from Mount Stuart, various alpine grasses are found which make very desirable feed. Fat formed from this dry feed is much harder than that gained from the soft watery grasses of the swamps.

About the head of Mad River and the Entiat, grazing is mostly done at the altitudes above the yellow-pine zone, where a scrubby growth of subalpine fir, white-bark pine, and lodgepole pine forms a scattered forest which has been greatly reduced by fire. Willow, huckleberry, pea vine, lupine, and various grasses and juncus have covered the hillsides, but the trampling and cutting of thousands of hoofs has in many places denuded the ground of every trace of vegetation.

Upward of 60,000 sheep were said to be ranging in this section and upon the tributaries of Entiat River in the Washington Forest Reserve. About 15,000 were reported on the Teanaway, and a number of bands were in the Mount Stuart region.

MINERAL SPRINGS.

Springs of mineral, sulphur, or soda water are not uncommon in the Cascade Mountains, and there are some deserving of mention.

At Hot Springs, a station on the Northern Pacific Railway, there are five springs which have become well known by reason of their desirable medicinal properties and their accessibility. At this point a large hotel is being built to replace one destroyed by fire in 1899. Three of these springs have temperatures of from 120° to 122° F., and can therefore be used for bathing and heating purposes.

Analyses made in 1893 gave results as follows:

Analyses of water from mineral springs near Hot Springs station, Wash.

Constituent.	No. 1.	No. 2.	No. 3.
	Grains per gal.	*Grains per gal.*	*Grains per gal.*
Sulphate of lime	1.3707	1.3315	0.7358
Sulphate of potash	2.1666	2.4353	1.2439
Sulphate of soda			1.5417
Chloride of potassium	10.4302	12.1715	
Chloride of sodium	2.7564	1.2964	9.5762
Chloride of magnesium	0.5840	Trace.	
Chloride of iron	0.1810	0.1343	
Carbonate of soda			0.8234
Carbonate of magnesia			0.0701
Carbonate of iron			0.0408
Silica	4.5552	5.0808	4.7479
Lithia	Trace.	Trace.	Trace.

On Burnt Boot Creek, a half mile distant from the Middle Fork of Snoqualmie River, are several large springs having excellent properties for the treatment of rheumatism. Prospectors have quarried out of the solid rock a bath tub of liberal dimensions, and if these springs were made accessible they would become popular. Even in their present condition they have been tested, as evidenced by crutches and canes found in that vicinity.

At Madison, on the line of the Great Northern Railway, is a hot sulphur spring, very similar in taste and temperature to those at Hot Springs on the Northern Pacific Railway, of which analyses are given above. A three-story hotel is in course of construction at this point, and it will undoubtedly prove a popular resort.

On the bank of Money Creek, about 5 miles above Berlin, on the Great Northern Railway, is a small spring said to contain soda and iron, but no chemical analysis has yet been made. Gas constantly escapes from the water. The taste is not unpleasant. This spring is always visited by passing miners, and during the summer months parties frequently camp in the vicinity, to avail themselves of the waters.

On the North Fork of Skykomish River, 5 miles east of Galena, are several large mineral springs, both hot and cold. Being located in a mineral region which has been pretty well explored, these springs are well known to prospectors, but they have no general reputation.

Near Peshastin Creek, in sec. 22, T. 20 N., R. 17 E., is a cold sulphur spring which is generally considered to possess excellent health-giving properties. In years gone by it was a favorite camping place for the Indian tribes, who came from afar to bathe in its waters. A crude bath house is maintained by persons who have located at this point, but being remote from the main traveled routes, the spring is not of much importance.

On the Little Wenache River, about 8 miles above Lake Wenache, there is said to be a large soda spring of excellent quality. As its exact location was not learned, it was not visited. It is difficult of access and visited only by hunters. It will in time add to the attractions of Lake Wenache, which is destined to become a popular summer resort.

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PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Professional Paper No. 6.]

The serial publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of the United States—folios and separate sheets thereof, (8) Geologic Atlas of the United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

The Bulletins, Professional Papers, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, Methods of hydrographic investigation; N, Water power; O, Underground waters; P, Hydrographic progress reports. This paper is the third in series H, the complete list of which follows (all are Professional Papers thus far):

SERIES H, FORESTRY.

4. The forests of Oregon, by Henry Gannett. 1902. 36 pp., 7 pls.
5. The forests of Washington, a revision of estimates, by Henry Gannett. 1902. 38 pp., 1 pl.
6. Forest conditions in the Cascade Range, Washington, between the Washington and Mount Rainier forest reserves, by Fred G. Plummer. 1902. 42 pp., 11 pls.

Besides the foregoing, three volumes on forestry have been published, as Part V of the Nineteenth, Twentieth, and Twenty-first annual reports, each consisting of several papers.

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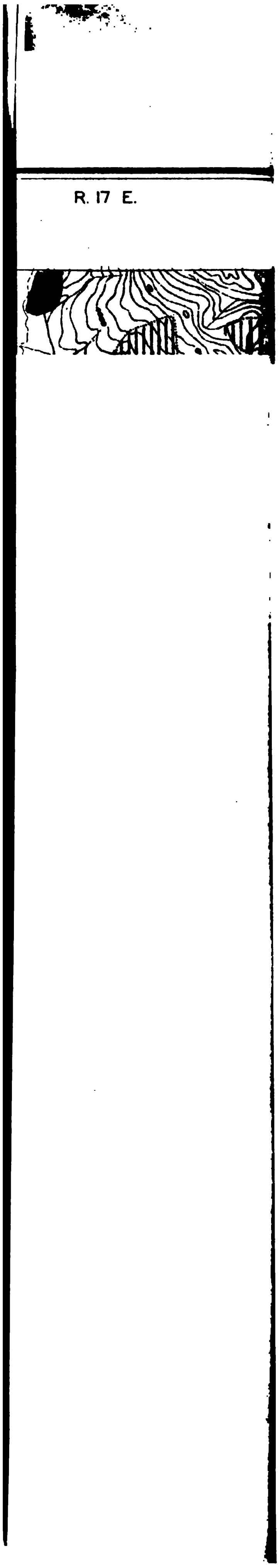
WASHINGTON, D. C.

NOVEMBER, 1902.

J. C. Bran



ON

J. C. B

Professional Paper No. 7 | Series H, Forestry, 4

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

FOREST CONDITIONS

IN THE

OLYMPIC FOREST RESERVE, WASHINGTON

FROM NOTES BY

ARTHUR DODWELL AND THEODORE F. RIXON

WASHINGTON
GOVERNMENT PRINTING OFFICE
1902

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LETTER OF TRANSMITTAL.

Department of the Interior,
United States Geological Survey,
Washington, D. C., June 17, 1902.

Sir: I beg to transmit herewith, for publication as a professional paper, a report upon the forest conditions of the Olympic Forest Reserve, Washington, prepared from field notes taken by Messrs. Arthur Dodwell and Theodore F. Rixon. This report treats of the reserve as originally constituted, including all the lands which have been thrown open in recent years.

Very respectfully yours,

Henry Gannett,
Geographer.

Hon. Charles D. Walcott,
Director United States Geological Survey.

FOREST CONDITIONS IN OLYMPIC FOREST RESERVE, WASHINGTON.

From notes by ARTHUR DODWELL and THEODORE F. RIXON.

LOCATION AND BOUNDARIES.

This reserve is situated in the northwestern part of Washington and occupies most of what is known as the Olympic Peninsula. Its original limits, as set forth in the executive order of President Cleveland of February 22, 1897, were as follows:

Beginning at the southeast corner of township twenty-one (21) north, range five (5) west, Willamette base and meridian, Washington; thence northerly along the surveyed and unsurveyed range line between ranges four (4) and five (5) west, to the point for the northeast corner of township twenty-three (23) north, range five (5) west; thence easterly along the unsurveyed and surveyed township line to the point for the southeast corner of township twenty-four (24) north, range four (4) west; thence northerly along the unsurveyed range line to the point for the northeast corner of said township; thence easterly along the unsurveyed and surveyed sixth (6th) standard parallel north, to the southeast corner of township twenty-five (25) north, range three (3) west; thence northerly along the surveyed and unsurveyed range line between ranges two (2) and three (3) west, to the northeast corner of township twenty-nine (29) north, range three (3) west; thence westerly along the surveyed and unsurveyed seventh (7th) standard parallel north, to the point for the southeast corner of township thirty (30) north, range nine (9) west; thence northerly along the unsurveyed and surveyed range line to the northeast corner of said township; thence westerly along the township line between townships thirty (30) and thirty-one (31) north, to the northeast corner of township thirty (30) north, range fourteen (14) west; thence northerly along the range line to its intersection with the shore of the Strait of Juan de Fuca; thence northwesterly along said shore line to the east boundary of the Makah Indian Reservation; thence southerly along the east boundary to the southeast corner of said reservation and westerly along the south boundary thereof to the high-water mark on the Pacific coast; thence southerly along said coast line to the north boundary of the Quinaielt Indian Reservation; thence southeasterly along the north boundary to the eastern point of said reservation and southwesterly along the south boundary thereof to the point of intersection with the fifth (5th) standard parallel north; thence easterly along said parallel to the southeast corner of township twenty-one (21) north, range five (5) west, the place of beginning.

On April 7, 1900, this reserve was reduced by the elimination of the following tracts, all situated in Clallam County. Most of these areas were withdrawn from the reserve because a large proportion of the land had been alienated by the Government:

Townships twenty-eight (28) north, ranges thirteen (13) and fourteen (14) west, Willamette base and meridian, Washington; fractional township twenty-eight (28) north, range fifteen (15) west; sections one (1) to eighteen (18), both inclusive, townships twenty-nine (29) north, ranges three (3), four (4), and five (5) west; sections four (4), five (5), six (6), seven (7), and the north half of section eight (8), township twenty-nine (29) north, range twelve (12) west; all of township twenty-nine (29) north, range thirteen (13) west, except sections thirteen (13), twenty-three (23), twenty-four (24), twenty-five (25), and twenty-six (26); township twenty-nine (29) north, range fourteen (14) west; fractional township twenty-nine (29) north, range fifteen (15) west; sections one (1) to twelve (12), both inclusive, township thirty (30) north, range nine (9) west; sections twenty-seven (27) to thirty-four (34), both inclusive, township thirty (30) north, range ten (10) west; sections twenty-five (25) to thirty-six (36), both inclusive, township thirty (30) north, range eleven (11) west; sections seventeen (17) to thirty-six (36), both inclusive, township thirty (30) north, range twelve (12) west; townships thirty (30) north, ranges thirteen (13) and fourteen (14) west; and township thirty (30) north, range fifteen (15) west.

The reserve now comprises an area of 3,030 square miles, or 1,939,200 acres, and includes parts of Clallam, Jefferson, Chehalis, and Mason counties.

The work of examining this reserve has been carried on during the seasons of 1898, 1899, and 1900 by Messrs. Arthur Dodwell and Theodore F. Rixon. During the first season they examined 10 townships situated in the eastern part of the reserve. During the second season they examined 61 townships, comprising the northern and most of the western parts of the reserve, the total area examined in these two seasons comprising 71 townships, several of them being partial or fractional townships. During the season of 1900 they completed the survey of the reserve by the examination of the remaining 36 townships. The total area examined during these three seasons was 3,483 square miles. As most of these examinations were made prior to the reduction in the reserve which was above noted, they include the areas which have since been withdrawn, but, as matters of information, their description of the townships and portions of townships since withdrawn from the reserve are here given.

This area, with its topographical and general forest characteristics, is shown on Pl. I. Considering the areas gone over, the examinations were exceedingly minute. They included estimates for each section of the following items of information: The timbered, burned, cut, and nontimbered areas; the depth of humus and forest litter; the total stand of timber, and the stand of the principal species recognized by the lumber trade; the average height, diameter, and clear length; and the percentage of dead and diseased trees. Of course it is understood that these are estimates only, but they are estimates based on observation and made by the best of trained observers—men who for many years have followed the profession of estimating the stand of timber.

TOPOGRAPHY.

The reserve includes the Olympic Mountain group, with its slopes upon the east, north, and south, together with the long slope to the west, and a considerable extent of lowland bordering the Pacific coast. The Olympics are a group of mountains of nearly circular shape, radiating from a central mass. This central mass culminates in Mount Olympus, with an altitude of 8,150 feet. Many other summits rise to altitudes ranging between 7,000 and 8,000 feet, and large areas lie above timber line, which here has an altitude of 5,500 to 6,000 feet. In the neighborhood of the timber line are great tracts of open country, some of which is covered with ice, other is barren and rocky, while much of the greater part of it consists of open grass lands, which will in the future be of value for summer pasturage.

Glaciers and snow fields are numerous in the central parts of the mountains, and though individually of small area, collectively cover a large territory.

This mountain mass is drained by many rivers, which head in or near the central mass and radiate outward in all directions. The streams flowing to the east empty into Hood Canal, and are short, with steep descents. The principal of these are the Quilcene, Dusewallips, Duckabush, Hamahama, and Skokomish. To the south flow the Humptulips, Wynooche, and Satsop. To the north, into the Strait of Juan de Fuca, flow the Dungeness and Elwha, while to the west flow directly into the Pacific the Quillayute, with its branches, the Dickey, Soleduck, Bogachiel, and Kalawa, and Hoh River, Queets River, and the Queniult. These westward-flowing streams are much longer than the others and have much less rapid courses.

The climate of this region is controlled by the prevailing westerly winds from the Pacific Ocean, and is characterized by great uniformity of temperature and by a very heavy rainfall, that at Neah Bay, on the northwest coast, being probably the heaviest in the United States, with the possible exception of the Alaskan coast. The purpose in making this reserve was not, therefore, the preservation of the water supply, since that is ample- indeed, almost excessive in its amount—but the preservation of its forest resources from wasteful destruction.

AGRICULTURAL LAND.

Along the northern edge of the reserve, in Clallam County, there is a narrow strip of comparatively level land, and upon the west side is a large area of equally level or undulating land, extending north and south across the reserve, with a breadth of about three townships eastward from the coast. Nearly all of this, however, is heavily forested. It contains a few prairie openings of trifling amount, having a total area of about 4,000 acres. These prairies may, of course, be classed as agricultural land, and, it may be added, have been entirely taken up by settlers. The rest of this large area of land, which is approximately level, is heavily forested.

In the southern edge of the reserve, in Chehalis and Mason counties, there are also large areas of land which are level, or nearly so, and are covered with dense forests.

If this land were cleared of its timber it should unquestionably be classed as agricultural land, but the expense of clearing it, which ranges from $100 to $200 per acre, seems to take it out of that category, for no farm land in any part of the United States, except in the immediate neighborhood of great cities where the land could profitably be used for market gardening, is worth any such price. It is true that the cost of clearing the land would be met, in part, by the value of the timber removed; but this would, in any case, be only a small part of the expense involved. The claim, therefore, that in these heavily forested, well-watered regions the land should be classed as agricultural appears to be ill founded. It is true that much of this heavily-timbered land has been taken up, and some of it undoubtedly by bona fide settlers, but that the experiment has proved unprofitable is shown by the fact that, although 341 homestead entries have been made within the limits of the reserve in Clallam County, there were in 1899 only 83 residents found there. This appears to furnish incontestable evidence that the experiment of farming under the prevalent conditions in this region has not proved profitable.

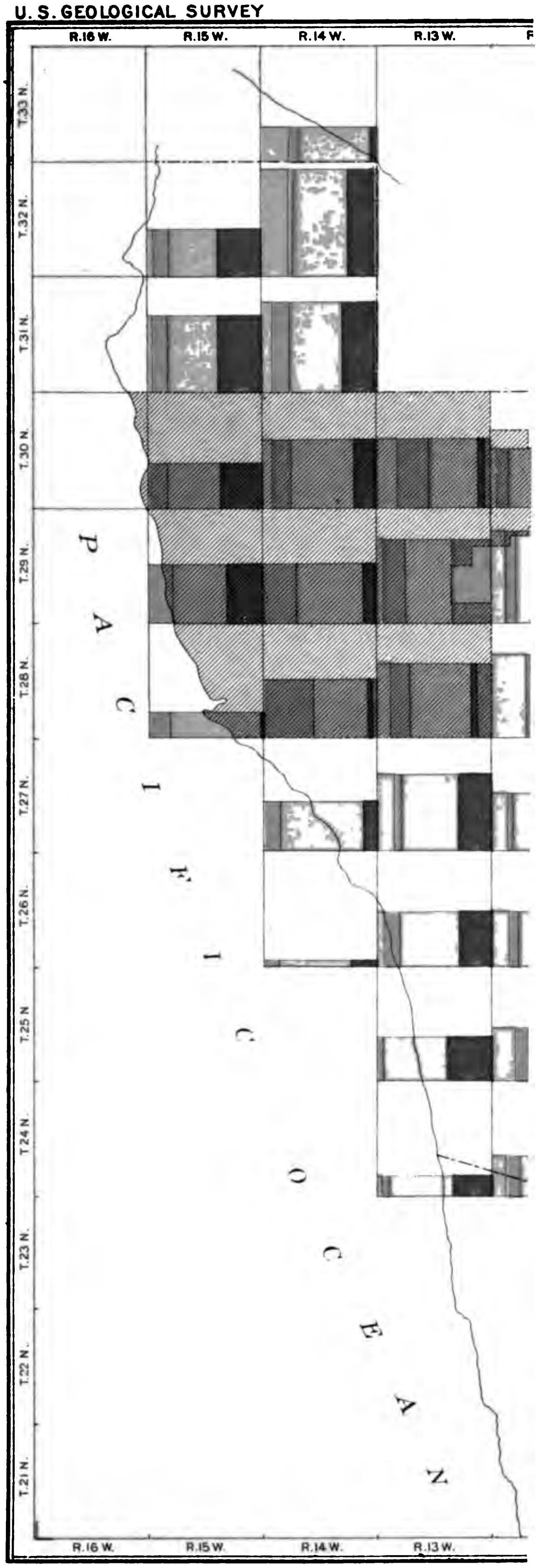
STAND OF TIMBER.

Taken as a whole this is the most heavily forested region of Washington, and, with few exceptions, the most heavily forested region of the country. The densest forests are found in the townships near the Pacific coast, in the northwestern part of the reserve, and in the southern tier of townships; while in the mountains, as the altitude increases, the forests become less dense and the species become of less value for lumber. The distribution of forests, as regards the stand of timber, is shown upon Pl. I, and by townships, as a unit, upon the diagram which constitutes Pl. II. In this the stand of timber is represented by the height of the column of colors, and the breadth of the several color bands indicates the proportional amount of the different timber species.

The total area examined was 3,483 square miles. Of this 2,883 square miles, or 83 per cent, are covered with merchantable timber; 177 square miles, or 5 per cent, have been burned; 16 square miles have been logged; 255 square miles, or 8 per cent, are naturally timberless, consisting almost entirely of alpine meadows; and 150 square miles, or 4 per cent, consist of rocks and ice, lying high up near the summits of the mountains.

The timber of the reserve amounts to the enormous total of 60,998,250 M feet B. M., sufficient to supply the entire United States demand for two years. The average stand upon the timbered lands is 33,000 feet B. M. per acre. Taking the township as a unit the average stand per acre upon its timbered land ranges from

U. S. GEOLOGICAL SURVEY



3,000 feet B. M., amid the high mountains, up to 59,000 feet B. M. on T. 32 N., R. 14 W., in the northwest corner.

The timber consists, as classified by lumbermen, of the following species and amounts:

Amount of timber in Olympic Forest Reserve, by species.

Species.	M feet B. M.	Per cent.
Red fir	14,521,750	24
Cedar	6,390,250	10
Hemlock	25,837,250	42
Spruce	3,492,500	6
Lovely fir	10,756,500	18

The greater part of the red fir is found along the southern border of the reserve. The stand is heavy also in the eastern tier of townships, and there is also considerable in the northern part of the reserve, but in the high mountains and in the neighborhood of the Pacific coast this species is practically entirely wanting. The tree grows to the largest dimensions in those areas where the stand is heaviest, reaching a maximum average per township of 243 feet in height, with 56 inches in diameter and 77 feet clear height. The tree is everywhere very free from disease, even in the high mountains, where the conditions are not favorable for its growth.

Cedars are found in all parts of the reserve, excepting in the high mountain region. They are especially abundant in the neighborhood of the Pacific coast, where the Alaska cedar finds a congenial habitat, especially in the low, swampy lands bordering the rivers, near their mouths. The tree is not tall, scarcely reaching half the height of the red fir, but exceeds it in girth. It commonly reaches its greatest development where the stand is heaviest, but this is not always the case. The highest average height per township in the reserve is 144 feet, and the greatest diameter 54 inches. The clear height is nowhere great, the greatest average per township being 35 feet. The tree is extremely subject to disease, a large proportion being rotten at the heart. Indeed, in many townships nearly half the stand is injured by disease.

Hemlock is by far the most abundant tree on the reserve, being found in considerable quantity in every township, and in many townships it forms more than half the stand. It is not a large tree, either in height or diameter, and the amount of clear trunk is not great. It is little affected by disease, excepting in the high mountains, where the percentage of diseased trees is great.

The spruce upon the reserve consists almost entirely of Sitka spruce, the Engelmann spruce being in such small quantities as to cut no figure from a merchantable point of view. Sitka spruce is found only in the neighborhood of the coast, extending inland nowhere more than 30 miles, and generally ceasing within less than that distance from the coast. Its stand is heaviest a little back from the coast, since immediate coast conditions seem to be rather too damp for its best development. While not as tall as the red fir, it is in girth and probably in timber yield the greatest tree of the reserve. The maximum average height, taking the township as a whole, is 226 feet, 81 feet of which is clear. Its maximum average diameter is 62 inches, or more than 5 feet. The tree is little affected by disease, less so probably than any other species upon the reserve.

The lovely fir is very abundant in the Olympic Reserve, being second in amount only to the hemlock. It is found everywhere excepting on the immediate coasts of the Pacific, and except in the highest mountains the stand is heavy. It is a mountain tree, not being found in any commercial amount below an altitude of about 1,500 feet. It is not a large tree, the maximum average height per township being 164 feet, and the diameter 35 inches. It appears to be but slightly subject to disease.

TIMBER TREES.

The principal timber trees of the reserve are as follows:

Red fir (*Pseudotsuga taxifolia*): This tree grows in abundance. Indeed, it is the principal forest tree throughout the western part of the State of Washington, with the exception of the country immediately bordering on the Pacific Ocean, while it extends up the mountain slopes to an altitude of about 3,500 feet.

Lovely fir (*Abies amabilis*): A tall silvery-barked tree found at considerable elevations, being rarely found below 1,500 feet.

Subalpine fir (*Abies lasiocarpa*): Found only on the higher parts of the mountains and rarely below an elevation of 5,000 feet.

White pine (*Pinus monticola*): This is found on the western slope of the reserve above an elevation of 500 feet, being frequently found in swamps and wet places.

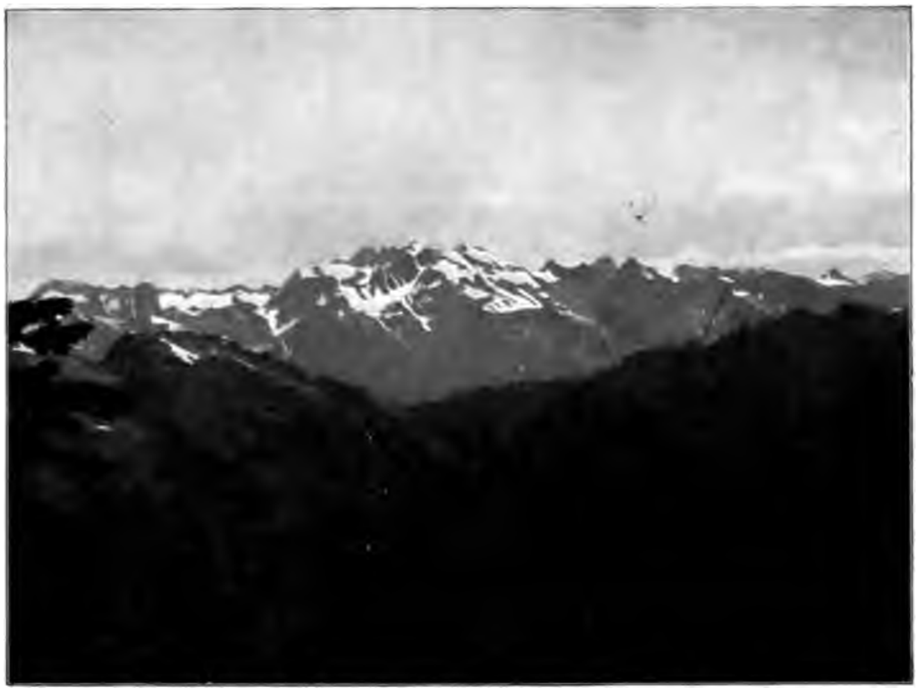
Red cedar (*Thuja plicata*): This tree forms an important component of the forest upon the coast, where it is often seen measuring 50 feet in circumference. Indeed, one tree in the valley of the Elwha measured 84 feet in circumference. It is commonly found growing in low and swampy lands.

Alaska cedar (*Chamæcyparis nootkatensis*): This is found on mountain ridges below 3,500 feet.

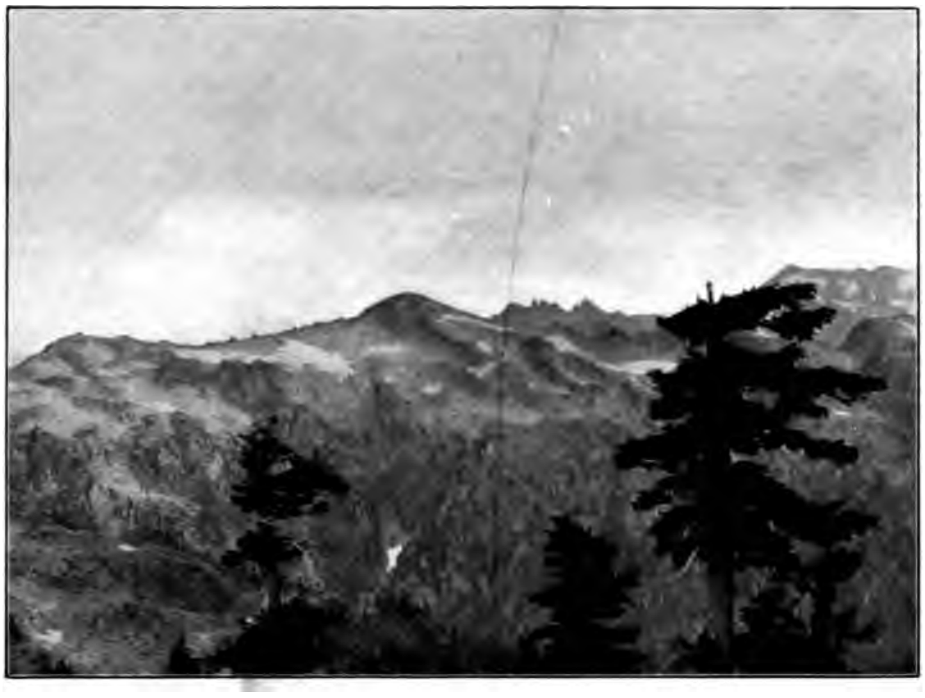
Sitka spruce (*Picea sitchensis*): This is found only in the neighborhood of the Pacific coast.

Mertens hemlock (*Tsuga mertensiana*): This tree is an almost universal component of the forest up to an altitude of 4,500 feet.

Vine maple (*Acer circinatum*): A small tree, sometimes trailing like a vine, which is common at altitudes below 2,000 feet.



A. MOUNT OLYMPUS.



B. DIVIDE BETWEEN QUEETS AND QUENIULT RIVERS.

Maple (*Acer macrophyllum*): A pretty shade tree which often grows very large. It is found only upon bottom lands, and is used for making fine furniture, taking a beautiful finish. It is rarely found at altitudes above 1,500 feet.

Madroña (*Arbutus menziesii*): This species is found along Puget Sound and in the valley of Elwha River. The wood is of a brown color and very tough. It is seldom found more than 12 inches in diameter.

Cottonwood (*Populus trichocarpa*): This is common along streams or on low, wet ground, often growing to a diameter of 5 feet. It is of value for paper pulp.

PLANTS AND SHRUBS.

Alder (*Alnus oregona*) is commonly found along streams of lower altitudes. Dogwood (*Cornus nuttallii*), salal, crab apple, bearberry, and rhododendron are also found.

FOREST FIRES.

As will be seen from the map (Pl. I), considerable tracts of timber land have been burned over, the total area being 177 square miles, or 5 per cent of the area of the reserve. These burns, as shown on the map, are mainly along the northern border and in the northeastern part of the reserve, on waters flowing into the Strait of Juan de Fuca.

The fires east of the Elwha were started about seven years ago from a ranch, and have continued to extend nearly every year. In no case is the fire great enough to burn up the timber completely, but only sufficient to kill the trees and leave them standing. Most of the litter and humus is consumed, and the loss of the humus has seriously retarded reproduction. What reproduction there is in this district is mostly balsam and fir of very inferior quality and of no value whatever for timber, as it branches too close to the ground. Reproduction of red fir is practically impossible, since in no instances observed has it been reproduced after fire. The only two burned areas that have been restocked are those in secs. 2, 3, 4, 8, 9, 10, 11, 12, and 13, T. 30 N., R. 11 W., and in T. 29 N., R. 3 W., where the young growth is balsam and fir. In other burns the old dead timber is standing, with no reproduction whatever except a few small hemlocks here and there. Even the underbrush has not yet commenced to grow.

HUMUS, FOREST LITTER, AND UNDERBRUSH.

The depth of humus is very great along the coast line and adjacent rolling country, but gradually diminishes as the altitude increases, until finally vegetation ceases altogether and the land on the higher ridges is completely bereft of all soil, being washed by the melting snows year after year until nothing is left but the barren rock or rotten shale and slate.

The forest litter is extremely heavy, being made up of the windfalls of centuries—in fact, the most expensive item in clearing land in western Washington is getting rid of the rotten and decayed wood, which never dries, but in clearing has to be continually turned over and burned until it is finally all consumed, after immense trouble and labor.

The forest litter, of course, is much heavier in the burns, where considerable timber is down, and is increased by falling trees and timber. When finally the light penetrates the gloom the underbrush, comprising huckleberry, salmon berry, devil's walking cane, salal, wild currants, and blackberries, commences to thrive, getting so matted together that it is next to impossible to force one's self through the network of vines.

As the altitude increases the underbrush diminishes, until finally it ceases altogether.

On the lower lands the density of the timber growth has practically nothing to do with the growth of the underbrush, as in numerous places it has been noticed that where a heavy growth of fir and hemlock is standing the brush is extremely dense. The principal requirements for the growth of underbrush are dampness and gloom, as too much sun absorbs the moisture.

LOGGING.

But little logging has been done within the limits of the reserve, an area of only 10,289 acres having been logged. In T. 30 N., R. 9 W., along the north boundary, about 5,000,000 feet B. M. of fir and cedar have been removed, and on Squim Bay, in T. 29 N., R. 3 W., a few logs have been cut near the shore, perhaps 250,000 feet B. M. of fir and spruce. In T. 25 N., R. 3 W., a little more than a quarter section has been cut. It is only in the southern tier of townships that logging operations on any considerable scale have been carried on. From Kamilche and Shelton, on Puget Sound, logging railroads have been extended up into T. 21 N., R. 5 W., and T. 21 N., R. 6 W. In these two townships 1,640 and 7,440 acres have been cut, respectively, the timber being shipped by rail to Puget Sound. The output here is not far from 500,000 feet B. M. per day. In T. 21 N., R. 9 W., 1,031 acres have been cut in the valley of Humptulips River, whence the timber has been floated to Grays Harbor.

The reason why logging operations have not been carried on more extensively is that the rivers are too swift and subject to too many freshets, the logs being hung on the numerous bars or washed up into the brush out of the river bed. Moreover, there are no places to catch and hold the logs if they were driven down the river successfully. Especially is this true of the rivers emptying into the ocean.

A. DIVIDE BETWEEN QUEETS AND QUENIULT RIVERS.

B. ELWHA RIVER VALLEY.

MINING.

Mining operations are being pushed considerably along the ridge dividing Lillian Creek from Morse Creek—in other words, along the north watershed of the Elwha, but so far nothing that will pay to work has been found. All the mines are prospects; no large amount of work has yet been done on any of them.

Assays shows $4 or $5 in gold and copper per ton, but no free-milling ore has yet been discovered. The formation does not warrant the belief that any paying mine will ever be located upon this portion of the reserve. No granite (except a few bowlders), slate, or porphyry has thus far been discovered on the reserve.

GRAZING LANDS.

Large areas of grazing lands are found in the mountainous portions of the reserve, mostly upon the tops of the ridges, between an elevation of 4,000 and 6,000 feet. They are scattered among bunches of timber, but for the most part lie above timber line, as shown by the map (Pl. I). The total area of these high mountain pastures is estimated at about 255 square miles, or about 8 per cent of the area examined. At present there is no grazing carried on, mainly on account of the difficulty of cutting trails, but it is believed that in the near future grazing will become a profitable industry.

ROADS AND TRAILS.

There are numerous roads and trails within the reserve—in fact all of the surveyed townships have one or more wagon roads and numerous trails. The latter, however, are mostly grown up and hard to find. The principal roads are the following:

From Port Angeles to Piedmont, on Lake Crescent; from Port Angeles, by way of Elwha and Lake Sutherland, to Lake Crescent; from Clallam to La Push, at the mouth of the Hoh River; from Quillayute Prairie to Dickey Lake; and several in T. 29 N., Rs. 5, 4, and 3 W.

The traveled trails are as follows: From Dungeness River 6 miles; from the intersection of Indian River and the Elwha up Elwha River to within 4 miles of its head; from Sappho, near Lake Pleasant, to the head of Soleduck River; from Lake Crescent to intersection with trail on Soleduck; up the North Fork of Kalawa River to intersection with Soleduck trail, crossing through low divide in sec. 11, T. 29 N., R. 12 W.; up Bogachiel River to sec. 31, T. 28 N., R. 10 W.; up Hoh River to sec. 36, T. 27 N., R. 11 W.; numerous trails all along and through the coast country and Lake Ozette to West Clallam, and finally a main trail starting from Hoquiam, or Grays Harbor, running north to Queniult Lake and thence to the Queets and Clearwater. From the latter stream it runs north to Hoh River, connecting through to Port Angeles. There are numerous branches leading off from this, but they are short and bad.

NAVIGATION.

The Indians pole their canoes up nearly all the rivers for a considerable number of miles, trapping and fishing. This is the only way of navigating, as the currents are so swift that it is impossible to row or paddle. Even this form of navigation is practicable only at low water, for when the rivers are in flood it is dangerous to be upon them, not only on account of the swiftness of the current, but because of the presence of driftwood. Queniult River is navigable for canoes from the lake at the eastern point of the Indian reservation to its mouth, and most of the supplies for the few settlers in the valley above the lake are brought in by this route. Queets River is utilized in a similar manner.

RAILROAD CONSTRUCTION AND LOGGING FACILITIES.

There are no railroads in the reserve at present, except the logging railways from Shelton and Kamilche into T. 21 N., R. 5 W., and T. 21 N., R. 6 W., noted elsewhere in this report. The survey for the Port Angeles Eastern, from Port Angeles, Wash., to Olympia, Wash., passes around the head of Squim Bay, in T. 29 N., R. 3 W., and a logging road which starts at Clallam ends at the northeast corner of T. 30 N., R. 9 W., but eventually will be extended to Lake Crescent.

A railroad can be easily constructed from the head of the logging road in T. 30 N., R. 9 W. up Lyre River, around Lake Crescent, and through the low divide at the head of the lake, to the Soleduck, and thence up the Soleduck or down the coast.

Roads can also be easily built up any of the rivers very cheaply, as the country is generally flat for a quarter of a mile or more on either side of them and has very light grades, and, with the exception of two canyons on the Elwha, all of the rivers are free from these obstructions.

Eventually a railroad will be built either from some point on the Strait of Juan de Fuca or from Grays Harbor, thence around the coast, with spurs up the numerous rivers, in order to tap the timber belts.

Taken as a whole, there is very little timber on the west slope of the reserve that can not be easily reached, and when the time comes when that quality of timber is marketable there are very few reserves, if any, that can be logged so easily and thoroughly as the western slope of the Olympic Forest Reserve.

Within the area of the Olympic Forest Reserve the streams which are suitable for driving purposes are few in number, and are, in most cases, drivable for only short distances above their mouths. Of all the streams flowing out of the mountains

A LAKE ON DIVIDE BETWEEN QUEETS AND HOH RIVERS.

B. FORKS OF QUENIULT RIVER

to the east into Puget Sound, none are drivable. All are short, with steep gradients, and flow in narrow, rocky canyons. Of those flowing southward the only streams which can be used for driving logs for any part of their length are the East and West forks of Humptulips River and Wishkah River, and these can be used for this purpose only 4 to 6 miles within the reserve—that is, in the southern tier of townships. Of the streams flowing to the west the Queniult, Queets, and Clearwater are unfitted for driving purposes. Hoh River can be used as far as the east line of R. 12 W. The Bogachiel and its branch, the Kalawa, can be used for driving logs as far up as the east line of range 13. The Dickey is drivable for half a dozen miles, and the Ozette from Ozette Lake to its mouth.

The only stream within the entire reserve which is drivable for any great distance is the Soleduck, by which logs can be transported from the east line of R. 10 W. to its mouth.

Except in cases where these drivable streams can be utilized it will be found necessary to build railroads in order to get the timber out, and fortunately for this purpose, the valleys of all the streams, excepting those flowing eastward into Puget Sound, are of easy grade and sufficiently wide for the construction of such roads. Of course in the higher parts of the mountains, where the timber is scanty and poor, the construction of such roads will be difficult and expensive, but it will probably be many generations before the timber in these regions will be needed.

DETAILED DESCRIPTIONS.

TOWNSHIP 21 NORTH, RANGE 5 WEST.

This township, situated in the southeast corner of the reserve, consists mainly of rolling table-lands, rising into mountains along the west line and in the northwest corner. The soil is chiefly clay and loam, and the underbrush is dense. The township is heavily timbered, mainly with red fir, with a little hemlock and cedar, all of good quality.

The timber in the north part of this township can be logged to the South Fork of Skokomish River, up which it will be necessary to build a railroad, as the river is not drivable. In the south part of the township the timber can be logged cheaply by railroad by an extension to existing roads.

Forest conditions in T. 21 N., R. 5 W.

Timbered area	acres..	16,920
Burned area	do...	4,480
Cut area	do...	1,640
Total stand of timber	feet B. M..	814,250,000
Average stand per acre	do...	48,100
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 21 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	742	161	32	36	5	11	177
Cedar	11	98	26	16	2	7	121
Hemlock	61¼	103	18	14	2	4	118

TOWNSHIP 21 NORTH, RANGE 6 WEST.

This township, in the southern tier of the reserve, is rolling and broken in the northeastern part and in the northwest corner, while the southern part is gently rolling. It is drained by Middle and West forks of Satsop River. The timber consists chiefly of red fir of good quality and very heavy stands. There is considerable hemlock and a small amount of cedar, the latter also being of good quality. A large part of this township, fully one-third of it, has been logged off and subsequently burned, and logging operations are at present being actively carried on in sections 16, 20, 21, and 22. The lumbering is being carried on by means of a railroad built from Oyster Bay on Puget Sound.

The soil is clay loam on the creeks and rivers, becoming gravel on the uplands. The underbrush is dense.

Forest conditions in T. 21 N., R. 6 W.

Timbered area	acres..	15,600
Cut area	do...	7,440
Total stand of timber	feet B. M..	749,500,000
Average stand per acre	do...	48,000
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 21 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	531	204	41	46	4	9	216
Cedar	39	153	41	25	7	17	212
Hemlock	179½	124	21	21	3	5	134

TOWNSHIP 21 NORTH, RANGE 7 WEST.

This township, situated on the south line of the reserve, has a steep, rolling and broken surface, drained by the East and West forks of Satsop River. There are trifling burned areas in sections 6 and 7, amounting altogether to 50 acres.

The timber consists chiefly of red fir, in heavy stands, the trees being very large and containing much clear lumber. Perhaps four-fifths of the entire stand is of good quality. The hemlock upon the township is small, not more than half of it of good quality. The cedar, of which there is a considerable amount, is mainly of good quality. The soil consists mostly of red shot clay and loam. The underbrush is dense.

The western part of this township can be logged into Wynooche River with ease. The remainder of the township can be logged to the two branches of Satsop River, but neither of these streams is of any value for logging purposes, as the banks are low and there are many sand bars. Their valleys, however, afford easy routes for logging railways.

Forest conditions in T. 21 N., R. 7 W.

Timbered area	acres..	23,000
Burned area	do...	50
Total stand of timber	feet B. M..	1,211,750,000
Average stand per acre	do...	52,600
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 21 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	747	230	51	59	9	8	239
Cedar	121¾	145	48	35	8	13	234
Hemlock	324	144	23	30	5	7	148
Spruce	3	203	50	63	2	4	200
Lovely fir	16	155	19	32	2	4	143

TOWNSHIP 21 NORTH, RANGE 8 WEST.

This township consists of rolling, broken country, drained by Wynooche and Wishkah rivers, and the East Fork of Humptulips River. It is well timbered throughout, the timber consisting chiefly of red fir, with considerable hemlock, and small amounts of cedar and lovely fir. The fir is very large and of good quality; the cedar and hemlock are small and somewhat scattered, half of these two species only being of good quality. The soil consists of red shot clay and gravel. The underbrush is dense.

The eastern part of this township can be logged to Wynooche River, although this is a poor logging stream, with low banks and a great many sand bars. The southwestern part can be logged to Wishkah River, which is a good logging stream, with good banks. The method used on this river in driving logs is by means of splash dams built at favorable points along the river. The northwest corner of this township can be logged to the East Fork of Humptulips River, which can be driven during the winter season. The valley of the river is favorable for the construction of a logging railroad.

Forest conditions in T. 21 N., R. 8 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	1,165,500,000
Average stand per acre	do...	50,600
Depth of humus	inches..	6
Litter		Heavy

Statistics of forest trees in T. 21 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	792½	226	50	72	4	6	237
Cedar	68	132	45	27	8	15	222
Hemlock	253	145	22	26	4	8	136
Lovely fir	52	151	31	35	3	5	150

TOWNSHIP 21 NORTH, RANGE 9 WEST.

This township, situated on the south boundary of the reserve, consists of rather steep, rolling land, rising to a maximum elevation of 1,230 feet. A small part consists of level bottom land along the West Fork of Humptulips River, which with the East Fork drains the township. The timber consists chiefly of fir, of good quality, with very heavy stands. It contains also some cedar, spruce, and hemlock, but these species are quite scattering, and only 60 per cent of the trees are of good quality. The soil consists mainly of red shot clay. The underbrush is dense.

This township can be logged to Humptulips River, which is a good logging stream during the winter season. At present parties are cutting timber in sections 20, 21, and 29, in the valley of the West Fork of Humptulips River.

Forest conditions in T. 21 N., R. 9 W.

Timbered area	acres..	21,809
Burned area	do...	200
Cut area	do...	1,031
Total stand of timber	feet B. M..	1,159,250,000
Average stand per acre	do...	53,100
Depth of humus	inches..	5
Litter		Heavy.

A. EVERGREEN POST-OFFICE.

B. RANCH IN SEC. 14, T. 21 N., R. 10 W.

Statistics of forest trees in T. 21 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	741½	217	42	72	4	6	226
Cedar	36½	127	45	25	8	17	210
Hemlock	313	125	21	23	5	8	143
Spruce	49¾	191	49	57	3	5	199
Lovely fir	18½	150	30	36	2	4	160

TOWNSHIP 21 NORTH, RANGE 10 WEST.

This township, situated on the south line of the reserve, consists entirely of gently rolling land. A small part of section 6 lies within the Queniult Indian Reservation. There are within the township three small burns, comprising altogether three-fourths of a section. The timber consists almost entirely of red fir, cedar, and hemlock. The first is of good quality, with very heavy stands; the cedar occurs mainly in the swamps, and is of very good quality; the hemlock, however, is small and not more than half of it is of value. There is in the township a little spruce, but it is quite scattering. The soil consists of clay and gravel in the upland, and in the swamps clay and loam. Underbrush is everywhere dense.

This township can all be logged southeastward to Humptulips River, which is a good logging stream during the winter season. Another means of getting the timber is by building a railroad, which can be carried through in part of the township very cheaply.

Forest conditions in T. 21 N., R. 10 W.

Timbered area	acres..	22,560
Burned area	do...	480
Total stand of timber	feet B. M..	1,058,500,000
Average stand per acre	do...	47,000
Depth of humus	inches..	7
Litter		Heavy.

Statistics of forest trees in T. 21 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	446	214	41	49	7	6	220
Cedar	226	128	39	30	10	21	216
Hemlock	336	138	22	27	4	6	148
Spruce	50½	197	48	54	3	4	192

TOWNSHIP 21 NORTH, RANGE 11 WEST.

More than two-thirds of this township is included within the Queniult Indian Reservation, the portion within the forest reserve comprising the southeastern part. The surface consists mainly of level, swampy land, the remainder being slightly rolling upland. The timber consists mostly of cedar of good quality, the stands of which are in some localities very heavy. Some good fir is found on the bench lands, and considerable hemlock, which, however, is small and of poor quality. There is also a little spruce, which is of excellent quality. The soil consists of clay and gravel on the uplands, and in the swamp of clay loam. The underbrush is dense.

This township can be logged eastward to Humptulips River very cheaply.

Forest conditions in T. 21 N., R. 11 W.

Timbered area	acres..	7,095
Total stand of timber	feet B. M..	253,250,000
Average stand per acre	do...	35,700
Depth of humus	inches..	8
Litter		Heavy.

Statistics of forest trees in T. 21 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	19½	196	39	45	7	9	217
Cedar	145½	121	31	26	10	25	205
Hemlock	77	132	19	22	5	7	144
Spruce	11¼	192	44	48	2	5	184

TOWNSHIP 22 NORTH, RANGE 5 WEST.

This township is drained mainly by the South Fork of Skokomish River. East of the river the surface consists of rolling and level bench lands. On the west the country is moutainous and rugged. The soil is clay, sand, and loam on the bottom lands, while on the upland it consists of clay and gravel. The underbrush is dense. The timber consists chiefly of red fir, with some hemlock and cedar, all of excellent quality.

The timber in this township will have to be logged by two different routes, that in the northern part by a railroad from Lake Cushman through the northeastern part of the township. The south part of the township can be logged into the South Fork of Skokomish River.

Forest conditions in T. 22 N., R. 5 W.

Timbered area	acres..	22,080
Burned area	do...	960
Total stand of timber	feet B. M..	768,750,000
Average stand per acre	do...	34,800
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 22 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	672½	152	24	24	3	6	160
Cedar	23¾	79	11	10	2	6	83
Hemlock	70½	99	11	10	2	4	106
Lovely fir	2	148	22	20	3	9	147

TOWNSHIP 22 NORTH, RANGE 6 WEST.

This township is mountainous and somewhat rugged, and is drained mainly southward by the West Fork of Skokomish River, and by the East and Middle forks of Satsop River, while the northern part is drained by the North Fork of Skokomish River. The timber consists chiefly of red fir and hemlock, half of which is of good size and quality. It contains also a little cedar and lovely fir, but in scattering form. The soil is clay in the valleys, grading to gravel upon the mountains. The underbrush is dense, consisting of huckleberry, salal, vine maple, salmon berry, devil cane, yew, arrowwood, dogwood, alder, elderberry, and ferns.

The south and west parts of this township can be logged down the Middle and East forks of Satsop River, the eastern part down the West Fork of Skokomish River, while the northern part can be logged to the North Fork of Skokomish. On all these streams it would be necessary to build skid roads and tramways, as they are not drivable, and owing to the rugged character of the country the township would be an expensive and difficult one to log.

Forest conditions in T. 22 N., R. 6 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	631,250,000
Average stand per acre	do...	27,400
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 22 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	355½	168	29	28	4	8	181
Cedar	32¾	95	17	13	6	11	106
Hemlock	224	123	18	16	4	9	141
Lovely fir	19	98	18	16	5	17	150

TOWNSHIP 22 NORTH, RANGE 7 WEST.

The surface of this township, with the exception of a tract of bench land and bottom land along Wynooche River, is all steep, rugged, and mountainous. It is drained by Wynooche River and the West Fork of the Satsop. There is on the former stream quite an area of bottom land. A tract of 615 acres, or nearly one section, lying mostly in section 19, has been burned. The timber in the township consists mainly of red fir in very heavy stands, large, and of good quality. There is also considerable hemlock, lovely fir, and cedar—not large, but of good quality. The soil consists of clay and gravel. The underbrush is dense.

The western part of this township can be logged to Wynooche River, which, however, is of no value as a logging stream, since it has low banks and flows through a deep canyon in this township. There is, however, a good route for a railroad along the river. The eastern part of the township can be logged to the West Fork of Satsop River, which, like the Wynooche, is of no value for driving purposes, but offers a good route for a railroad from the south.

Forest conditions in T. 22 N., R. 7 W.

Timbered area	acres.	22,425
Burned area	do...	615
Total stand of timber	feet B. M..	1,022,500,000
Average stand per acre	do...	45,600
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 22 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	430	219	49	59	9	10	233
Cedar	101	132	39	25	10	18	209
Hemlock	364	147	22	22	6	9	143
Lovely fir	127½	142	22	31	3	6	138

TOWNSHIP 22 NORTH, RANGE 8 WEST.

The surface of this township is rugged and mountainous, with the exception of a tract of bench land in the southeast corner, in the valley of Wynooche River. It is drained by that stream and by the East Fork of Humptulips River. The timber consists chiefly of hemlock and lovely fir, four-fifths of which is large, clear, and of good quality. It contains also some red fir, in large stands and of good quality. This is found on the bench lands in the southeastern part of the township. The soil is red shot clay, and the underbrush is dense.

The eastern part of this township can be logged to Wynooche River, which, as has been stated elsewhere, is of no value as a logging stream, having low banks and many sand bars. The western part can be logged to the East Fork of Humptulips River, which, however, is in the same condition; but a railroad can be built easily along each of these rivers, thus affording access to the timber.

Forest conditions in T. 22 N., R. 8 W.

Timbered area	acres.	22,940
Burned area	do...	100
Total stand of timber	feet B. M..	1,077,500,000
Average stand per acre	do...	46,900
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 22 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	133	210	47	50	8	8	228
Cedar	65½	131	36	27	7	13	216
Hemlock	528	146	28	29	5	7	150
Lovely fir	351	153	33	37	3	5	153

TOWNSHIP 22 NORTH, RANGE 9 WEST.

The surface of this township consists almost entirely of rolling and broken hills and mountains. It is drained in part by the West Fork of Humptulips River, which flows southwestward across it, and by several smaller streams. The timber consists mostly of cedar, hemlock, and lovely fir, with a trifling amount of spruce and red fir. Perhaps 70 per cent of the stand in the township is of good quality. The soil consists of clay and gravels, and the underbrush is dense.

The eastern part of this township can be logged to the West Fork of Humptulips River, which, however, is of no use as a logging stream, since there are low banks and many sand bars; still there can be built, with little expense, a tramway along the river bank, and the timber can then be handled with skid roads and chutes to the valley. The western part of this township can be logged very cheaply toward the west.

Forest conditions in T. 22 N., R. 9 W.

Timbered area	acres..	22,870
Burned area	do...	170
Total stand of timber	feet B. M..	926,500,000
Average stand per acre	do...	40,300
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 22 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	17½	214	42	48	6	8	226
Cedar	152	131	41	27	9	18	221
Hemlock	475	138	21	26	7	10	143
Spruce	22	180	47	48	3	5	195
Lovely fir	260	140	25	32	4	6	141

TOWNSHIP 22 NORTH, RANGE 10 WEST.

The northwest half of this township lies within the Queniult Indian Reservation, the southeastern half only being within the forest reserve. It contains a large burn, mainly in sections 12 and 13, comprising 1,240 acres. The surface of the township is rolling, becoming more level in the western part. The timber consists chiefly of cedar and hemlock, three-fifths of which is of good quality. There is also a little red fir and spruce of good quality. The soil is red shot clay, and the underbrush dense.

This township can be logged very cheaply by means of a railroad into it from Grays Harbor.

Forest conditions in T. 22 N., R. 10 W.

Timbered area	acres..	10,260
Burned area	do...	1,240
Total stand of timber	feet B. M..	429,000,000
Average stand per acre	do...	42,000
Depth of humus	inches..	6
Litter		Heavy.

Statistics of forest trees in T. 22 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	58½	224	49	50	7	6	229
Cedar	119	141	48	29	14	24	219
Hemlock	215¾	138	21	28	7	6	147
Spruce	35¾	213	52	55	3	5	215

TOWNSHIP 23 NORTH, RANGE 5 WEST.

This township, situated in the southeastern part of the reserve, is rugged and mountainous, with the exception of a small area of bottom land above Lake Cushman and on Skokomish River just above the lake. The soil is clay and loam. The underbrush is dense. The timber consists of fir, with some hemlock and cedar, all of excellent quality.

The timber in the northern part of this township can all be logged into Lake Cushman very cheaply; that in the southern part of the township should be logged to the South Fork of Skokomish River, which would be somewhat expensive, owing to the ruggedness of the country.

Forest conditions in T. 23 N., R. 5 W.

Timbered area	acres..	19,105
Rugged and barren area	do...	640
Burned area	do...	2,560
Grazing area	do...	735
Total stand of timber	feet B. M..	542,250,000
Average stand per acre	do...	28,400
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 23 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	287¾	138	25	21	6	10	160
Cedar	71¾	108	21	16	6	13	133
Hemlock	116½	98	14	12	5	11	114
Lovely fir	66¼	98	15	13	5	14	114

TOWNSHIP 23 NORTH, RANGE 6 WEST.

This township, situated in the southern part of the reserve, is drained by the South Fork of Skokomish River. It is nearly all mountainous and rugged; it contains much snow, even in summer, and considerable areas of rocky and barren country. Its soil is thin, consisting mainly of clay and gravel. Underbrush is dense along the river and creeks, but sparse upon the mountains. The timber consists of red fir, hemlock, lovely fir, and cedar, all of excellent quality, except high upon the mountains.

The timber on this township can be logged to the South Fork of Skokomish River, although this is a poor logging stream, with low banks. It will probably be necessary to construct a railroad up its valley for the purpose of carrying out the timber.

Forest conditions in T. 23 N., R. 6 W.

Timbered area	acres..	20,736
Rocky and barren area	do...	1,664
Burned area	do...	192
Grazing area	do...	448
Total stand of timber	feet B. M..	383,500,000
Average stand per acre	do...	18,500
Depth of humus	inches	3
Litter		Heavy.

Statistics of forest trees in T. 23 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	161	158	27	24	7	12	178
Cedar	42¼	103	17	12	7	15	108
Hemlock	96¼	109	14	11	5	16	115
Lovely fir	84	106	14	12	5	15	112

TOWNSHIP 23 NORTH, RANGE 7 WEST.

The surface of this township is rugged and mountainous. It is drained by Wynooche River. It contains a considerable area of upland pasture, lying at great elevations. The timber consists chiefly of hemlock and lovely fir, three-fourths of which is of poor quality, being stunted and scrubby. Most of the stand of any value is in the valley of Wynooche River.

The soil consists of clay and gravel. The underbrush is dense along the river and creeks, consisting of huckleberry, salal, vine maple, salmon berry, devil cane, alder, yew, and ferns. On the upland the underbrush is light.

The timber in this township will be difficult and expensive to handle, as the river is of no value for driving purposes. The only possible outlet is by building a tramway along the river bank and handling the timber by means of chutes down to the tramway.

Forest conditions in T. 23 N., R. 7 W.

Timbered area	acres..	19,900
Rocky and barren area	do...	1,280
Mountain meadows	do...	1,860
Total stand of timber	feet B. M..	369,750,000
Average stand per acre	do...	19,000
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 23 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	53	143	28	34	8	17	214
Cedar	36¾	66	17	12	10	42	210
Hemlock	167½	88	18	15	9	42	203
Lovely fir	112½	78	18	15	8	44	204

TOWNSHIP 23 NORTH, RANGE 8 WEST.

The surface of this township is rough and mountainous, most of it lying at great elevations. It is drained mainly by the East and West forks of Humptulips River. The timber consists mainly of hemlock and lovely fir, all of which is of poor quality excepting that along Humptulips River. The soil consists of clay and gravel. The underbrush is dense and is composed of huckleberry, salal, alder, vine maple, salmonberry, devil cane, yew, arrowwood, ferns, and elderberry.

North of the divide a narrow strip of the township consisting of between one and two sections in width, can be logged to Queniult River, while the remainder of the township can be logged down Humptulips River, which, however, is of no value as a driving stream; still, a railroad or tramway could be built into this township from the south.

Forest conditions in T. 23 N., R. 8 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	481,500,000
Average stand per acre	do...	20,900
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 23 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	38	102	23	17	8	14	176
Hemlock	233½	117	20	19	6	14	146
Lovely fir	210	116	22	23	5	11	144

TOWNSHIP 23 NORTH, RANGE 9 WEST.

This township contains Queniult Lake and a trifling portion of Queniult Indian Reservation, which deducted from it leaves as the land surface of the township 31¼ sections, or 20,000 acres. The surface differs greatly in different parts of the township, the southeastern portion being steep and rugged, while the remainder of the township is level or rolling. The timber consists mainly of hemlock, which is found most abundantly on the high divides, and which is of very good quality. There is also some good fir timber in the bottom lands around the lake and river, while a little cedar and spruce are scattered over the township. The soil is a clay loam in the lowlands, and on the uplands clay and gravel. The underbrush is dense.

This township can be logged to Queniult Lake very cheaply, and there are numerous good locations for sawmills along its shores which can be reached by railroad from Grays Harbor to the southward.

Forest conditions in T. 23 N., R. 9 W.

Timbered area	acres..	22,955
Burned area	do...	85
Total stand of timber	feet B. M..	590,500,000
Average stand per acre	do...	25,600
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 23 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	119¼	205	41	43	5	7	215
Cedar	52	124	38	24	8	17	212
Hemlock	334¾	137	22	26	5	7	145
Spruce	18½	189	38	41	3	4	188
Lovely fir	66	138	25	30	4	6	142

TOWNSHIP 23 NORTH, RANGE 10 WEST.

Half of this township is included within the Queniult Indian Reservation and Queniult Lake, the northern half only being within the reserve. There is one small burn in the township, comprised mainly in section 14, with an area of 320 acres. The surface of the township, with the exception of a strip of bench land near the line of the Indian reservation, is rugged and mountainous, rising to a height of 2,700 feet. The timber consists chiefly of hemlock and lovely fir, 60 per cent of which is of good quality. There is a little scattering red fir, cedar, and spruce in the lowlands, but it is small and scrubby. The soil is red shot clay in the ridges and clay loam on the bench lands. The underbrush is very dense.

The timber on this township, with the exception of a small tract near its northern boundary, can be logged very cheaply to Queniult Lake.

Forest conditions in T. 23 N., R. 10 W.

Timbered area	acres..	10,200
Burned area	do...	380
Total stand of timber	feet B. M..	457,000,000
Average stand per acre	do...	45,000
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 23 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	40	185	34	40	2	4	200
Cedar	16¼	122	41	23	8	24	230
Hemlock	240¾	146	26	50	4	6	152
Spruce	28	178	35	36	2	4	173
Lovely fir	132	152	32	34	2	5	148

TOWNSHIP 23 NORTH, RANGE 11 WEST.

Five-sixths of this township is comprised within the Queniult Indian Reservation. The remaining sixth is a triangular strip along the line of the township, being the only portion within the forest reserve. The surface consists mainly of rolling country, with red shot clay soil, and heavily forested. The timber consists of hemlock, lovely fir, and cedar, there being no red fir or spruce reported. The undergrowth is dense, consisting of huckleberry, salal, salmon berry, ferns, alders, vine maples, devil cane, and arrowwood.

The timber on this fractional township can be logged only by railroad to the south or west.

Forest conditions in T. [illegible] N., R. [illegible] W.

Timbered area	acres..	[illegible]
Total stand of timber	feet B. M..	[illegible]
Average stand per acre	do...	[illegible]
Depth of humus	inches..	[illegible]
Litter		Heavy.

Statistics of forest trees in T. [illegible] N., R. [illegible] W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	14½	[illegible]	[illegible]	22	6	[illegible]	[illegible]
Hemlock	[illegible]	147	25	[illegible]	4	6	[illegible]
Lovely fir	[illegible]	152	30	24	2	6	[illegible]

TOWNSHIP 24 NORTH, RANGE 4 WEST.

This township is in the eastern part of the reserve. With the exception of a little over a section along Hamahama River, it is practically all rugged and mountainous. The soil is clay and loam in the bottom lands of the river and gravel on the mountain ranges. The underbrush is dense except on the ridges, and the timber consists of fir and hemlock, with some cedar and a little lovely fir. It is all tributary to Hamahama River, but as this stream is of no value for logging purposes and as there is not sufficient water for driving anything larger than shingle bolts, it will be necessary to build a railroad from Hood Canal up the valley of the river across the township.

Forest conditions in T. 24 N., R. 4 W.

Timbered area	acres..	21,917
Rocky and barren area	do...	550
Burned area	do...	213
Grass-land area	do...	360
Total stand of timber	feet B. M..	568,750,000
Average stand per acre	do...	25,900
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 24 N., R. 4 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	306¼	134	22	19	2	6	144
Cedar	62½	97	16	12	2	9	112
Hemlock	167	114	14	12	2	4	123
Lovely fir	31	117	14	12	2	4	122

TOWNSHIP 24 NORTH, RANGE 5 WEST.

This township, drained by Skokomish River and its North Fork, is very rugged and mountainous, with the exception of the narrow valleys of the streams. The soil is gravelly and rocky. The underbrush is mainly light. The timber consists of red fir, hemlock, cedar, and lovely fir, all of which is of good quality, except in the high mountains.

Most of the timber in this township can be logged to the North Fork of Skokomish River, with the exception of a small area in the eastern part, which is in the drainage basin of Hamahama River. The North Fork of the Skokomish is a poor logging stream, since it flows through a deep canyon with rock walls and has a steep slope.

Forest conditions in T. 24 N., R. 5 W.

Timbered area	acres..	17,600
Rocky and barren area	do...	1,600
Burned area	do...	640
Mountain meadows	do...	3,200
Total stand of timber	feet B. M..	485,500,000
Average stand per acre	do...	27,600
Depth of humus	inches.	3
Litter		Medium.

Statistics of forest trees in T. 24 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fed fir	137¼	176	28	20	8	12	178
Cedar	76½	85	16	11	5	10	98
Hemlock	140¾	116	17	12	9	20	126
Spruce	1¾	193	26	24	2	4	180
Lovely fir	129¼	126	18	14	8	20	132

TOWNSHIP 24 NORTH, RANGE 6 WEST.

This township is mountainous, with the exception of a small tract along Camp Six Stream. The soil is mainly clay and coarse gravel. Underbrush is chiefly light, except in the valleys of the creeks. The timber consists of lovely fir, hemlock, red fir, and cedar. The timber can be logged eastward to the North Fork of Skokomish River.

Forest conditions in T. 24 N., R. 6 W.

Timbered area	acres..	17,920
Rocky and barren area	do...	640
Mountain meadows	do...	4,480
Total stand of timber	feet B. M..	359,250,000
Average stand per acre	do...	20,000
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 24 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	59¼	145	24	21	8	16	153
Cedar	55¾	73	16	11	6	13	105
Hemlock	113½	93	15	11	7	18	110
Spruce	6¼	170	25	25	1	2	165
Lovely fir	124½	93	14	12	6	17	111

TOWNSHIP 24 NORTH, RANGE 7 WEST.

The surface of this township is rugged and mountainous. It is drained by Queniult River, flowing from northeast to southwest through it. It contains considerable area of grass land, lying at great elevation, mainly above timber line. The timber is nearly all hemlock and lovely fir, four-fifths of which is of poor quality. There is a small amount of red fir in the immediate valley of Queniult River. The soil is mainly gravel. The underbrush is dense along the rivers and creeks, and is composed of huckleberry, salal, yew, salmon berry, and vine maple.

The timber in this township will be very difficult and expensive to handle, as its surface is extremely rugged. It can be logged to Queniult River, but this is of no value as a driving stream, and it will be necessary to build a railroad into the township.

Forest conditions in T. 24 N., R. 7 W.

Timbered area	acres..	19,965
Rocky and barren area	do...	480
Mountain meadows	do...	2,560
Burned area	do...	35
Total stand of timber	feet B. M...	358,500,000
Average stand per acre	do...	18,000
Depth of humus	inches..	3
Litter		Light.

A. *B*

RANCHES IN QUEETS RIVER VALLEY

Statistics of forest trees in T. 24 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	27	132	27	26	7	12	196
Cedar	29¾	60	16	13	8	38	195
Hemlock	184¾	97	19	17	9	33	191
Lovely fir	117	94	20	18	8	31	187

TOWNSHIP 24 NORTH, RANGE 8 WEST.

The surface of this township is rugged and mountainous both in the northwest and southeast, while along Queniult River, which traverses the township from side to side, is a broad, level valley mainly of bench land. The timber on these bench lands consists mainly of fir of excellent quality. It is large and occurs in heavy stands, and scattered among it is a little spruce and cedar. Upon the hills and mountains are hemlock and lovely fir, but they are of poor quality, being stunted and scrubby.

The timber on the bench lands of Queniult River can be logged to that stream, or, since that is a poor driving stream, to a railroad up its valley, which affords an excellent route for such a road. The timber in the mountains will be very difficult and expensive to get out.

Forest conditions in T. 24 N., R. 8 W.

Timbered area	acres..	20,907
Rocky and barren area	do...	320
Mountain meadows	do...	1,493
Burned area	do...	320
Total stand of timber	feet B. M..	748,250,000
Average stand per acre	do...	36,000
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 24 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	187½	201	39	40	6	9	213
Cedar	75¼	118	49	20	9	14	192
Hemlock	321	132	22	22	6	11	148
Spruce	42	191	46	49	4	5	186
Lovely fir	122½	130	24	24	4	10	152

TOWNSHIP 24 NORTH, RANGE 9 WEST.

Nearly all this township consists of rugged, mountainous country, much of it lying at considerable altitude above sea, only one-third of its area consisting of grass land above the limit of timber, which is drained in part by the Queniult and in part by streams flowing to Queets River. A small area in the southeast corner, including most of the valley of the Queniult, has been burned. The timber consists mainly of lovely fir and hemlock, which is of good quality on the lowlands, while on the uplands it becomes scrubby and of no value except for firewood. Near the south line of the township there is a small tract of good red fir and spruce. The soil is gravelly. The underbrush is dense along the creeks and river, consisting of huckleberry, salal, vine maple, alder, yew, salmon berry, devil cane, and ferns. In the uplands it is of course light.

On the north of the divide the timber can be logged to Queets River, which is, however, of no value as a logging stream. On the south the timber can be handled to the Queniult, which also is of no value for this purpose; still both of these rivers afford a good route for a railroad, with very easy grades.

Forest conditions in T. 24 N., R. 9 W.

Timbered area	acres..	15,200
Burned area	do...	640
Mountain meadows	do...	7,200
Total stand of timber	feet B. M..	539,750,000
Average stand per acre	do...	34,200
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 24 N., R 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	13	178	40	45	4	6	213
Cedar	28¼	80	21	17	8	20	172
Hemlock	246½	118	24	22	6	15	161
Spruce	8	193	45	50	3	4	193
Lovely fir	244	123	27	26	4	11	156

TOWNSHIP 24 NORTH, RANGE 10 WEST.

This township consists almost entirely of rather steeply rolling lands. It is drained by Queets River and other smaller streams. The timber consists mainly of hemlock and lovely fir, 60 per cent of which is of good quality, the stands being

A. HOUSE IN SEC. 12, T. 24 N., R. 11 W.

B. GRANVILLE, AT MOUTH OF QUENIULT RIVER.

quite heavy on this township. There is a small amount of cedar and a trifling amount of spruce and fir found in the lower valleys. The soil is a red shot clay and gravel and the underbrush is dense.

This township can all be logged westward to Queets River by means of logging railways built up that stream and its branches.

Forest conditions in T. 24 N., R. 10 W.

Timbered area	acres..	22, 900
Burned area	do...	140
Total stand of timber	feet B. M..	910, 750, 000
Average stand per acre	do...	40, 000
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 24 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	6¼	188	33	39	3	4	211
Cedar	62½	116	44	21	8	19	226
Hemlock	459	147	26	27	5	8	148
Spruce	12	195	55	53	8	5	207
Lovely fir	371	152	32	34	3	5	149

TOWNSHIP 24 NORTH, RANGE 11 WEST.

The surface of this township is rolling in the northern and eastern parts, and level in the southern and western parts, especially along Queets River, which flows diagonally across it from northeast to southwest. Much of the valley of this river has been burned, mainly in sections 10, 15, 16, 17, and 19, the entire burned area amounting to 2,260 acres. The timber consists chiefly of cedar, hemlock, and lovely fir, about half of which are of good quality. There was considerable spruce in the township, but much of it was burned in the fire above referred to. The soil is a clay loam and gravel, and the underbrush is dense.

This township can be logged cheaply to Queets River, which, although of no value as a logging stream, having very low banks and many sand bars, still affords an excellent route for a railroad into the township for logging purposes.

Forest conditions in T. 24 N., R. 11 W.

Timbered area	acres..	20, 780
Burned area	do...	2, 260
Total stand of timber	feet B. M..	788, 250, 000
Average stand per acre	do...	37, 500
Depth of humus	inches..	7
Litter		Heavy.

Statistics of forest trees in T. 24 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	7½	188	33	39	2	4	207
Cedar	160¾	115	47	22	7	29	234
Hemlock	355	138	21	23	3	6	146
Spruce	37	198	52	55	2	4	206
Lovely fir	228	153	28	36	2	5	151

TOWNSHIP 24 NORTH, RANGE 12 WEST.

A strip along the southern portion of this township lies within the Queniult Indian Reservation, leaving an area within the forest reserve of 19,860 acres. The surface is mainly low, and to a great extent marshy, rising, however, in the northern part to rolling, broken hills. It is drained by Queets River, flowing from east to west across the southern portion, and by the Clearwater flowing in from the north. The timber consists chiefly of cedar and hemlock, half of which is of good quality. There is also some spruce, which is of excellent quality, and a little lovely fir. The soil is a clay loam and gravel, and the underbrush is dense.

This township can be logged very cheaply to Queets River, which, however, is of no value as a logging stream, since it has low banks and sand bars. There is an easy route for a railroad along this river, by means of which the township can be easily and cheaply logged.

Forest conditions in T. 24 N., R. 12 W.

Timbered area	acres..	19,736
Burned area	do...	124
Total stand of timber	feet B. M..	505,500,000
Average stand per acre	do...	25,000
Depth of humus	inches..	7
Litter		Heavy.

Statistics of forest trees in T. 24 N., R. 12 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	2	190	42	44	3	5	215
Cedar	166	132	49	24	7	39	239
Hemlock	221	124	20	20	4	7	141
Spruce	56	177	49	47	2	5	186
Lovely fir	60½	164	27	38	3	5	148

TOWNSHIP 24 NORTH, RANGE 13 WEST.

This is a fractional township lying on the Pacific coast, a part of it being included in the Queniult Indian Reservation. It comprises altogether only 8,280 acres, or a little more than one-third of a complete township. The surface is rolling in the eastern part, while in the western part, bordering on the coast, it is nearly all level swamp land. All the land is forested, the timber in the eastern part being of excellent quality, while that bordering on the coast is poor and scrubby. It consists mainly of hemlock and cedar, with a little spruce and lovely fir. The soil is a red shot clay on the upland, while in the swamp lands along the coast it is clay loam. The underbrush is dense.

This township can be logged cheaply by means of a railroad built near to and parallel with the coast.

Forest conditions in T. 24 N., R. 13 W.

Timbered area	acres..	8,280
Total stand of timber	feet B. M..	240,000,000
Average stand per acre	do...	29,000
Depth of humus	inches..	6
Litter		Heavy.

Statistics of forest trees in T. 24 N., R. 13 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	84	103	42	20	9	45	224
Hemlock	135	123	18	19	4	7	143
Spruce	14	169	44	40	2	4	192
Lovely fir	7	150	30	36	2	3	155

TOWNSHIP 25 NORTH, RANGE 3 WEST.

This township is mountainous, except some small tracts of bottom land along the Duckabush River. The soil is clay, loam, and gravel. The underbrush is dense except on the ridges. The timber consists mainly of red fir, with some hemlock and cedar, and the fir is of excellent quality.

This township will be very difficult to log because of the ruggedness of the country. In the southern part it can be logged southward into Hamahama River, while the eastern part of the township can be logged down Fulton Creek by tramway or skid road. The northern part can be logged into Duckabush River.

Forest conditions in T. 25 N., R. 3 W.

Timbered area	acres..	19,182
Mountain meadows	do...	3,680
Cut area	do...	178
Total stand of timber	feet B. M..	604,000,000
Average stand per acre	do...	31,000
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 25 N., R. 3 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	458¼	157	31	31	2	6	173
Cedar	34¾	73	11	9	3	5	89
Hemlock	102½	94	13	12	2	4	110
Lovely fir	8½	92	14	14	2	5	117

TOWNSHIP 25 NORTH, RANGE 4 WEST.

This township, which is traversed by Duckabush River from west to east, is mountainous and rugged, with the exception of about 1,000 acres of bottom land along the river. The soil on the upland is clay and coarse gravel, with clay and loam on the bottom land. The underbrush is dense on the bottom land, becoming sparser on the ridges. The timber consists of red and lovely fir and hemlock, with a little cedar.

The timber in this township is mainly in the northern part, and can be logged into Duckabush River, and the little which stands in the southern part of the township can be taken to Hamahama River.

Forest conditions in T. 25 N., R. 4 W.

Timbered area	acres..	16,622
Rocky and barren area	do...	1,760
Burned area	do...	178
Mountain meadows	do...	4,480
Total stand of timber	feet B. M..	340,000,000
Average stand per acre	do...	20,400
Depth of humus	inches..	3
Litter		Medium.

RANCH NEAR HEAD OF QUENIULT LAKE.

Statistics of forest trees in T. 25 N., R. 4 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	171	154	31	32	3	7	173
Cedar	6½	74	12	10	3	7	90
Hemlock	91	96	15	13	3	7	115
Lovely fir	71½	99	14	13	3	7	118

TOWNSHIP 25 NORTH, RANGE 5 WEST.

This township is drained mainly by Duckabush River, which flows across it from west to east. Its surface is mainly mountainous and very rugged. Its soil is clay and gravel, and the underbrush is light. The timber consists chiefly of hemlock and lovely and red fir, with a little cedar.

The timber in this township is principally in the northern part, and can be logged to Duckabush River. This stream, however, is of no value for driving purposes, and it will be necessary to build a tram road up its valley to get the timber out.

Forest conditions in T. 25 N., R. 5 W.

Timbered area	acres	12,480
Rocky and barren area	do	5,760
Mountain meadows	do	4,800
Total stand of timber	feet B. M.	206,000,000
Average stand per acre	do	16,500
Depth of humus	inches	2
Litter		Light.

Statistics of forest trees in T. 25 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	30¾	152	27	19	5	9	157
Cedar	16¼	52	10	8	5	16	78
Hemlock	72	90	16	12	8	30	116
Spruce	½	160	24	24	2	4	160
Lovely fir	86½	108	17	13	9	42	119

Township 25 North, Range 6 West.

This township consists entirely of rocky and mountainous country, through which flows Queniult River from northeast to southwest in a narrow valley or canyon. Nearly half its area consists of open grass lands at great elevations. The timber consists almost entirely of lovely fir and hemlock of poor quality, the stands being almost entirely in the river valley. The soil is mainly gravel and rock. The underbrush is dense along the river, while that on the upland is light. It consists of huckleberry, salal, yew, vine maple, alder, and ferns.

The timber on this township can be logged to Queniult River, which, however, is of no value as a driving stream, as it has low banks and many sand bars; still, tramways can be built along the river bank and the timber can be handled by means of chutes and skid roads.

Forest conditions in T. 25 N., R. 6 W.

Timbered area	acres..	16,547
Rocky and barren area	do...	1,813
Mountain meadows	do...	4,680
Total stand of timber	feet B. M..	196,750,000
Average stand per acre	do...	12,000
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 25 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	11¼	143	27	22	8	16	182
Cedar	9½	51	16	11	9	58	124
Hemlock	92	71	18	15	10	57	194
Lovely fir	84	71	18	15	9	53	194

Township 25 North, Range 7 West.

The surface of this township is rugged and mountainous, and a large proportion of it lies above timber line and consists of open grass land. The timber is composed chiefly of hemlock and lovely fir, which, except along the streams, where it is of good quality, is small and scrubby. The soil is mainly coarse gravel, and the underbrush is dense, especially along the rivers.

It will be very expensive to get the timber out of this township, owing to the ruggedness of its surface. The only means by which it can be done is by tramways built along the streams and by the use of chutes to bring the timber down from the mountain sides.

Forest conditions in T. 25 N., R. 7 W.

Timbered area	acres..	16,440
Rocky and barren area	do...	1,920
Mountain meadows	do...	4,680
Total stand of timber	feet B. M..	399,750,000
Average stand per acre	do...	24,300
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 25 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	8½	137	35	32	5	10	198
Cedar	31¼	74	22	17	9	41	183
Hemlock	206	112	23	20	8	29	161
Lovely fir	154	119	24	20	6	26	163

TOWNSHIP 25 NORTH, RANGE 8 WEST.

The surface of this township is very rugged and mountainous, much of it being at a considerable altitude. One-third of the township is at such an elevation as to be practically destitute of timber, and consists of upland pastures. The timber consists almost entirely of lovely fir and hemlock, with a little cedar along the streams. On Queets River, in the northwest corner, and the North Fork of Queniult, in the southeast, the timber is of good quality, but upon the mountain slopes it is small and stunted. The soil is thin and stony. The underbrush is dense along the creeks, but scanty on the mountain sides.

With the exception of a small tract of timber in the northwest corner, which can be taken to Queets River, this township can be logged to the North Fork of Queniult River. This, however, is of no value for driving purposes, but tramways can be built up its valley for the purpose of getting out the timber.

Forest conditions in T. 25 N., R. 8 W.

Timbered area	acres..	17,601
Rocky and barren area	do...	853
Mountain meadows	do...	4,586
Total stand of timber	feet B. M..	444,000,000
Average stand per acre	do...	25,200
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 25 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	½	135	32	36	4	6	190
Cedar	32½	73	22	16	9	35	175
Hemlock	220	101	22	19	8	33	162
Lovely fir	191	104	23	21	6	26	156

TOWNSHIP 25 NORTH, RANGE 9 WEST.

A large part of this township, especially all the southern half, is rugged and mountainous, with a considerable area of elevated grass land. Across the northern part flows Queets River, from east to west, carrying with it a broad belt of level bottom land averaging a mile in width. The timber consists mostly of hemlock and lovely fir, especially upon the mountainous portion of the township. In the bottom land of Queets River there is some red fir, cedar, and spruce, all of good quality. The soil is a clay loam, and the underbrush is dense.

This township can be logged to Queets River, although this is not a good logging stream, having low banks and not sufficient water for driving purposes. A railroad can, however, be built cheaply along its course.

Forest conditions in T. 25 N., R. 9 W.

Timbered area	acres..	24,876
Mountain meadows	do...	2,964
Total stand of timber	feet B. M..	881,500,000
Average stand per acre	do...	35,400
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 25 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	112	206	43	42	2	5	216
Cedar	75	115	36	21	8	26	215
Hemlock	402	133	24	24	5	11	149
Spruce	82½	199	48	48	2	4	202
Lovely fir	210	131	25	25	4	10	139

A. *B.*

FIR. SPRUCE, AND HEMLOCK IN QUEETS RIVER BOTTOM.

TOWNSHIP 25 NORTH, RANGE 10 WEST.

The surface of this township is steep and somewhat rugged, with the exception of a tract of bottom and bench land along Queets River a little more than a mile in width, stretching across the southern part of the township. The timber along the northern part of the township is nearly all hemlock and lovely fir, three-fourths of which is of good quality and in very heavy stands. In the southern part, in the bottom and bench lands of Queets River, there are some good stands of red fir, spruce, and cedar, all of excellent quality. The soil consists of clay and loam, and the underbrush is very dense.

The northern part of this township can be logged to Clearwater River, which flows across its northern edge from east to west. This stream is, however, of no value for driving purposes, and the timber will be quite expensive to handle. The southern part of the township can be logged cheaply to Queets River by building a railroad up its valley, which can be done at little expense.

Forest conditions in T. 25 N., R. 10 W.

Timbered area	acres	23,040
Total stand of timber	feet B. M.	1,001,250,000
Average stand per acre	do.	43,500
Depth of humus	inches	5
Litter		Heavy.

Statistics of forest trees in T. 25 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Age.*
Red fir	31½	203	42	42	3	6	217
Cedar	65½	122	37	24	7	22	212
Hemlock	466	156	28	29	4	6	161
Spruce	64¼	202	49	56	2	4	208
Lovely fir	374	164	29	34	3	5	160

TOWNSHIP 25 NORTH, RANGE 11 WEST.

The surface of this township is rolling, with a rather steep westward slope. It is drained by branches of Clearwater River. The entire surface is forested, the timber consisting chiefly of hemlock and lovely fir, with a little cedar and spruce. About four-fifths of the timber is of good quality, with large and heavy stands, especially along the streams. The soil is red shot clay in the valleys, grading to gravel in the uplands. The underbrush is dense everywhere.

With the exception of a small tract in the southeast corner, which can be logged to Queets River, the lumber can all be taken down the branches of Clearwater. Although none of these are good logging streams, still their valleys afford excellent routes for tramways, which can be built cheaply into the township.

Forest conditions in T. 25 N., R. 11 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	860,750,000
Average stand per acre	do...	37,400
Depth of humus	inches..	5
Litter		....

Statistics of forest trees in T. 25 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	61½	121	49	24	8	22	232
Hemlock	482	148	24	29	5	8	157
Spruce	24¼	200	53	54	2	4	205
Lovely fir	293	156	28	32	3	5	160

TOWNSHIP 25 NORTH, RANGE 12 WEST.

The surface of this township is nearly all open and mountainous, with the exception of the valley of Clearwater River, which flows from east to west across the southern part of the township with a belt of bottom land nearly a mile in width. The timber consists mostly of hemlock and lovely fir, of good quality. This is found only on the high ridges, while on the lowlands it becomes small and poor. There are some good stands of spruce, of excellent quality, and a little poor, scattering cedar. The soil is red shot clay on the upland, with clay and loam on the bottom lands. The underbrush is dense.

The entire area of this township can be logged to Clearwater River, which, however, is of no value as a logging stream, though a railroad can be built up its valley at little expense.

Forest conditions in T. 25 N., R. 12 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	676,750,000
Average stand per acre	do...	29,400
Depth of humus	inches..	6
Litter		Heavy.

Statistics of forest trees in T. 25 N., R. 12 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	¼	200	60	60	4	6	230
Cedar	38½	129	48	27	7	22	220
Hemlock	438	147	20	28	4	7	149
Spruce	73	225	56	61	2	4	213
Lovely fir	127	156	23	32	3	5	148

TOWNSHIP 25 NORTH, RANGE 13 WEST.

This fractional township lies on the Pacific coast, and comprises approximately 15,120 acres, all of which is timbered. The surface is somewhat rolling and broken in the eastern part, becoming more nearly level toward the coast. Near the latter are areas of marshy land. Along the coast the timber is small and scrubby and of poor quality, but improves in quality inland. It consists almost entirely of cedar and hemlock, 40 per cent of which, taken as a whole, is of good quality. The soil is red shot clay, and the underbrush is dense.

This township can be logged to the south and west by building a railroad into it, either from the Strait of Juan de Fuca or from Grays Harbor. There being no harbor in this neighborhood, it can not be logged directly to the coast.

Forest conditions in T. 25 N., R. 13 W.

Timbered area	acres	15,120
Total stand of timber	feet B. M.	533,500,000
Average stand per acre	do	35,300
Depth of humus	inches	6
Litter		Heavy.

Statistics of forest trees in T. 25 N., R. 13 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	218	99	54	21	7	43	241
Hemlock	287	131	19	21	4	6	152
Spruce	27	175	44	41	2	5	191
Lovely fir	1½	140	28	30	4	6	150

TOWNSHIP 26 NORTH, RANGE 3 WEST.

This township is drained mainly by Dusewallips River, which flows across it from east to west. Its surface, with the exception of small areas of bottom land along the river, is mountainous and rugged. The soil is very stony and gravelly. Underbrush is sparse. The timber consists of red fir and hemlock, with a little lovely fir and a trifling amount of cedar. It is all of good quality, except on the high divides, where it is small and stunted.

The timber in this township, with the exception of a few sections along the north line, which can be logged to Quilcene River, will go to Dusewallips River. This, however, is a poor logging stream, and it will be necessary to build a railroad or tramways along the river to get the lumber out.

Forest conditions in T. 26 N., R. 3 W.

Timbered area	acres..	17,780
Rocky and barren area	do...	1,660
Burned area	do...	1,680
Mountain meadows	do...	1,920
Total stand of timber	feet B. M..	606,000,000
Average stand per acre	do...	34,100
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 26 N., R. 3 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	332	162	27	41	7	3	186
Cedar	11	112	23	21	6	17	189
Hemlock	225	124	15	22	7	6	118
Lovely fir	38	130	15	35	18	8	152

TOWNSHIP 26 NORTH, RANGE 4 WEST.

This township is drained almost entirely by Dusewallips River, which flows across it from the northwest to the southeast. Its surface is mountainous and rugged, its soil clay and gravel, and the underbrush is sparse. The timber consists of hemlock and lovely and red fir, with a little cedar, all of good quality excepting on the high ridges, where the timber becomes small and stunted.

The timber can nearly all be logged to Dusewallips River, but as this is a poor logging stream it will be necessary to build a railroad or tramways up its valley; and moreover, owing to the steepness of the slopes, it will be necessary to bring the timber down in flumes from the ridges.

A. FIR 43 FEET IN CIRCUMFERENCE.

B. SECOND GROWTH OF FIR.

Forest conditions in T. 26 N., R. 4 W.

Timbered area	acres..	16,960
Rocky and barren area	do...	2,560
Mountain meadows	do...	3,520
Total stand of timber	feet B. M..	516,000,000
Average stand per acre	do...	30,400
Depth of humus	inches..	2
Litter		Medium.

Statistics of forest trees in T. 26 N., R. 4 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	119	108	25	24	3	5	153
Cedar	13½	72	19	27	6	19	133
Hemlock	186	72	15	15	4	9	120
Lovely fir	197½	84	17	17	4	13	127

TOWNSHIP 26 NORTH, RANGE 5 WEST.

This township contains the high divide at the heads of branches of Dusewallips, Elwha, and Queniult rivers, and is mountainous and rugged, with very little soil and light underbrush. It contains but little timber, consisting mainly of lovely and red fir and hemlock. The timber can be logged down the branches of Dusewallips, Queniult, and Elwha rivers, but as these streams are very rapid the timber will have to be handled by chutes and flumes.

Forest conditions in T. 26 N., R. 5 W.

Timbered area	acres..	9,950
Rocky and barren area	do...	6,050
Mountain meadows	do...	7,040
Total stand of timber	feet B. M..	101,750,000
Average stand per acre	do...	12,300
Litter		Light.

Statistics of forest trees in T. 26 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	15½	111	23	20	3	6	133
Cedar	3¼	67	15	11	8	25	118
Hemlock	38	74	15	11	5	25	120
Lovely fir	45	80	17	13	4	27	124

TOWNSHIP 26 NORTH, RANGE 6 WEST.

This township is drained almost entirely by Elwha River, and its surface is mountainous and rugged, with the exception of the narrow valley of the river. The soil is very thin and stony. The underbrush is light. The timber consists chiefly of hemlock and lovely and red fir, and is of poor quality, excepting in the narrow valley of the Elwha.

The timber can be logged mainly to Elwha River, although this is of no value as a logging stream, as it has low banks and not sufficient water for driving. Still, along its banks tramways or logging roads can be built.

Forest conditions in T. 26 N., R. 6 W.

Timbered area	acres..	14,686
Rocky and barren area	do...	3,946
Mountain meadows	do...	4,408
Total stand of timber	feet B. M..	296,000,000
Average stand per acre	do...	20,100
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 26 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	64	144	31	36	3	6	172
Cedar	5	80	20	18	6	20	130
Hemlock	101	84	17	15	4	26	125
Lovely fir	126	92	18	17	4	28	127

TOWNSHIP 26 NORTH, RANGE 7 WEST.

This township, which is drained mainly by Elwha River, is rugged and mountainous, with the exception of a narrow strip of valley land along the Elwha. The soil is a clay in the Elwha Valley, but the uplands are rocky and gravelly. The underbrush is very dense except in the higher country, where it becomes sparse. The timber consists of red fir, hemlock, and lovely fir. The fir, which occurs chiefly in the river valley, is of good quality. Elsewhere the timber is poor.

Nearly all of the valuable timber in this township is in the immediate valley of Elwha River, and as this stream is not drivable it will be necessary to build a railroad or tramway up the valley in order to reach it.

Forest conditions in T. 26 N., R. 7 W.

Timbered area	acres..	14,080
Rocky and barren area	do...	4,480
Mountain meadows	do...	4,480
Total stand of timber	feet B. M..	177,250,000
Average stand per acre	do...	12,600
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 26 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	19½	136	32	31	2	7	174
Hemlock	61¾	79	17	13	4	26	127
Lovely fir	96	87	18	15	4	36	131

TOWNSHIP 26 NORTH, RANGE 8 WEST.

This township has an extremely rugged and mountainous surface, and is drained mainly into Queets River. Nearly all of its area consists of open grass land lying at considerable elevation above sea, mainly above timber line, only about one-sixth of its area being timbered. The timber consists of cedar, lovely fir, and hemlock, all of alpine character, and of little value except for fuel.

The soil consists of rocks and gravel. The underbrush is dense along the river, but light upon the uplands. It consists of huckleberry, salmon berry, salal, yew, alder, vine maple, devil cane, and ferns.

All the timber of any value in this township stands along Queets River, and will be very expensive to handle, as the river is of no value for driving purposes.

Forest conditions in T. 26 N., R. 8 W.

Timbered area	acres..	3,760
Rocky and barren area	do...	2,560
Mountain meadows	do...	16,720
Total stand of timber	feet B. M..	111,250,000
Average stand per acre	do...	28,200
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 26 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	7½	86	20	15	8	39	167
Hemlock	55¼	111	24	30	7	24	161
Lovely fir	48¾	108	24	20	6	18	158

TOWNSHIP 26 NORTH, RANGE 9 WEST.

The surface of this township is, in the main, very steep, rugged, and mountainous. The timber consists mostly of lovely fir and hemlock, which is stunted and of little value, with the exception of that in the western part of the township, where it is of good quality.

The soil consists of plain gravel on the South Fork of Hoh River. The upland consists largely of bare rocks, with coarse gravel. The underbrush is dense along the river and creeks and light on the uplands. It consists of huckleberry, salmon berry, alder, salal, vine maple, yew, devil cane, and ferns.

On the north side of the divide the timber can be logged to the South Fork of Hoh River. This, however, is of no value as a logging stream, but affords a good route for a logging railway. South of the divide the timber can be logged to Queets River, which is also a poor logging stream. A small portion of the timber on the west side can be logged down branches of Clearwater River.

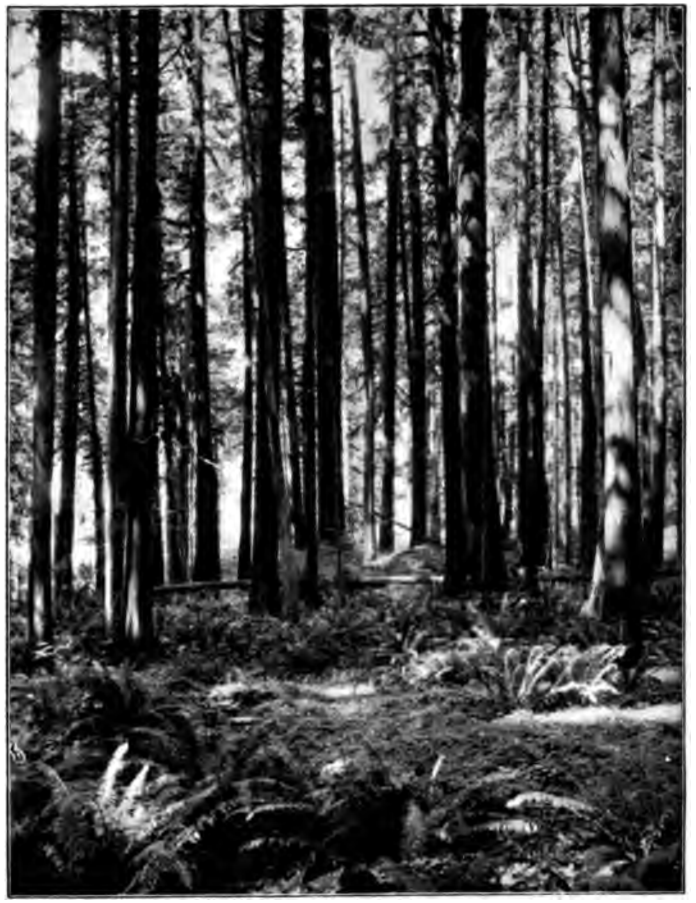
Forest conditions in T. 26 N., R. 9 W.

Timbered area	acres..	14,720
Rocky and barren area	do...	782
Mountain meadows	do...	7,538
Total stand of timber	feet B. M..	671,250,000
Average stand per acre	do...	45,600
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 26 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	8½	192	33	32	4	8	202
Cedar	46¾	94	30	18	9	29	161
Hemlock	305	130	23	22	7	24	154
Lovely fir	311	136	24	24	6	20	155

A. FIR AND SPRUCE



B. SMALL GROWTH IN MIXED FOREST.

TOWNSHIP 26 NORTH, RANGE 10 WEST.

This township consists of rugged, mountainous country, drained on the north to Hoh River and on the south to the Clearwater. The timber consists chiefly of hemlock and lovely fir, four-fifths of which is of good quality, with very heavy stands. Red fir, cedar, and spruce are scattered over the township.

The soil consists of red shot clay, which becomes stony along the creeks. The underbrush consists of dense huckleberry, alder, vine maple, salmon berry, yew, arrowwood, and ferns.

The northern part of this township can be logged to Hoh River, which, however, is of no value as a logging stream, owing to the fact that its banks are low and its course interrupted by sand bars. On the south the timber can be taken to the Clearwater, which is also of no value; still each of these rivers affords excellent routes for logging railroads.

Forest conditions in T. 26 N., R. 10 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	1,051,000
Average stand per acre	do...	45,400
Depth of humus	inches..	4
Litter		Heavy.

Statistics of forest trees in T. 26 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	15½	201	42	49	4	7	219
Cedar	43	119	35	22	7	19	215
Hemlock	476	152	28	27	4	6	159
Spruce	8½	197	49	53	2	4	205
Lovely fir	508	162	30	37	2	4	165

TOWNSHIP 26 NORTH, RANGE 11 WEST.

The surface of this township is steep, rugged, and broken, with the exception of a strip of gently sloping land along the north line. It is drained by Hoh River and small streams flowing directly into the Pacific. The timber consists mainly of hemlock and lovely fir, three-fourths of which is of good quality, the stand being very heavy along the dividing ridges. There are also scattering firs, cedars, and spruces, mostly of good quality.

The soil consists of red shot clay, which becomes gravelly along the streams. The underbrush consists of dense salal, vine maple, salmon berry, devil cane, huckleberry, yew, arrowwood, and ferns.

North of the divide this township can be logged to Hoh River, south of it to Clearwater. The latter, however, is of no value as a logging stream, but its valley affords an excellent route for a railroad, which can be built into the township from the south.

Forest conditions in T. 26 N., R. 11 W.

Timbered area	acres..	22,720
Burned area	do...	320
Total stand of timber	feet B. M..	937,250,000
Average stand per acre	do...	41,200
Depth of humus	inches..	5
Litter		Heavy.

Statistics of forest trees in T. 26 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	9½	198	44	56	3	6	219
Cedar	88½	125	47	24	8	19	233
Hemlock	459	146	25	29	4	7	159
Spruce	24¾	198	52	52	2	4	204
Lovely fir	355½	160	28	35	3	5	132

TOWNSHIP 26 NORTH, RANGE 12 WEST.

The eastern part of this township is mountainous and rugged; the western is gently sloping and rolling, with many cedar swamps. The soil is clay and loam along the river and in the swamps, while the upland has a red clay, gravelly soil. The underbrush is dense, except on the uplands, where it becomes sparse. The timber is mainly hemlock, with some cedar, lovely fir, and a little spruce. There is no red fir in the township. Hemlock, spruce, and lovely fir are of good quality, but the cedar is poor.

Most of the timber in this township can be logged to Hoh River, which is a good logging stream at all seasons. The western part of the township can be logged cheaply; the eastern part will be quite expensive to handle on account of the ruggedness of the surface.

Forest conditions in T. 26 N., R. 12 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	682,500,000
Average stand per acre	do...	29,600
Humus		Light.
Litter		Heavy.

TOWNSHIP 26 NORTH, RANGE 14 WEST.

This is a fractional township lying on the Pacific Ocean, comprising only about four sections. Its surface is steeply rolling, with a rocky bluff along the coast. The soil is red clay. The underbrush is dense. The timber consists of hemlock, cedar, and spruce. The last is of good quality, but the other species are of little value.

Forest conditions in T. 26 N., R. 14 W.

Timbered area	acres..	2,560
Total stand of timber	feet B. M..	93,000,000
Average stand per acre	do...	36,300

Statistics of forest trees in T. 26 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	21	110	58	27	9	40	226
Hemlock	60	124	19	21	5	9	150
Spruce	12	180	53	50	2	5	182

TOWNSHIP 27 NORTH, RANGE 3 WEST.

This township is composed entirely of mountainous and rugged country. Quilcene River, which traverses it, has a narrow valley. The soil is very stony. The underbrush is dense along the streams, but light along the ridges. The timber consists of hemlock and red fir, with a little lovely fir. It is of good quality, excepting on the high divides, where it becomes small and knotty. Along Quilcene River red fir is very heavy.

Forest conditions in T. 27 N., R. 3 W.

Timbered area	acres..	16,000
Rocky and barren area	do...	1,280
Burned area	do...	2,445
Mountain meadows	do...	2,880
Total stand of timber	feet B. M..	511,500,000
Average stand per acre	do...	32,000
Depth of humus	inches..	2
Litter		Light.

A HEMLOCK.

B. HEMLOCK AND LOVELY FIR.

Statistics of forest trees in T. 27 N., R. 3 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	167½	174	33	44	16	9	200
Cedar	8	95	26	17	16	24	184
Hemlock	240¾	119	18	19	14	11	124
Lovely fir	95¼	112	18	20	14	25	122

TOWNSHIP 27 NORTH, RANGE 4 WEST.

The surface of this township is rugged and mountainous. It is drained mainly toward the northeast by Dungeness River. The southwest corner is drained by Dusewallips River. The soil is chiefly a clay derived from the underlying slates. The underbrush is dense along the rivers and light on the ridges. The timber, which is very light, consists of lovely fir and hemlock of little value.

Forest conditions in T. 27 N., R. 4 W.

Timbered area	acres..	11,200
Rocky and barren area	do...	5,440
Mountain meadows	do...	7,040
Total stand of timber	feet B. M..	33,500,000
Average stand per acre	do...	3,000
Litter		Light.

Statistics of forest trees in T. 27 N., R. 4 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	1½	120	20	20	2	8	140
Hemlock	12¾	72	16	12	2	21	124
Lovely fir	19¼	79	17	13	2	25	128

TOWNSHIP 27 NORTH, RANGE 5 WEST.

This township is mountainous throughout. It has little soil, and what little there is is very stony. The underbrush is light. It contains little timber, consisting of lovely fir and hemlock of poor quality.

Forest conditions in T. 27 N., R. 5 W.

Timbered area	acres..	2,560
Rocky and barren area	do...	5,760
Burned area	do...	7,040
Mountain meadows	do...	7,680
Total stand of timber	feet B. M..	35,750,000
Average stand per acre	do...	14,000
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 27 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	1½	95	19	18	2	7	135
Hemlock	14¼	72	16	11	3	22	124
Lovely fir	20	80	17	13	4	26	126

TOWNSHIP 27 NORTH, RANGE 6 WEST.

With the exception of a narrow strip of bench land along Elwha River, the surface of this township is mountainous. The soil is clay and gravel. The underbrush is dense in the Elwha Valley, but light upon the ridges. The timber consists of red and lovely fir and hemlock. The red fir is of good quality, but the other species are of little value. The timber in this township can be logged most economically to Elwha River, although this is a poor logging stream, and it will be necessary to build a railroad or tramway up its valley.

Forest conditions in T. 27 N., R. 6 W.

Timbered area	acres..	18,880
Rocky and barren area	do...	1,280
Burned area	do...	1,280
Mountain meadows	do...	1,600
Total stand of timber	feet B. M..	425,000,000
Average stand per acre	do...	22,500
Depth of humus	inches..	2
Litter		Medium.

Statistics of forest trees in T. 27 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	155½	.176	29	37	3	5	207
Hemlock	146	91	18	17	5	12	122
Lovely fir	123½	88	17	18	5	12	120

TOWNSHIP 27 NORTH, RANGE 7 WEST.

This township is mountainous throughout, with very thin, scanty soil and light underbrush. The timber, which is scanty, consists mainly of lovely fir and hemlock, with a little red fir, all of poor quality.

Forest conditions in T. 27 N., R. 7 W.

Timbered area	acres..	14,720
Rocky and barren area	do...	5,440
Mountain meadows	do...	2,880
Total stand of timber	feet B. M..	49,250,000
Average stand of timber	do...	3,300
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 27 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	8	98	18	16	2	7	132
Hemlock	17	72	15	11	3	23	125
Lovely fir	24¼	80	17	13	3	25	123

TOWNSHIP 27 NORTH, RANGE 8 WEST.

This township is drained mainly by Hoh River, toward the north. Its surface is mountainous and rugged, with the exception of the valley of Hoh River. The mountainous country contains much snow and many glaciers. The soil is clay and in the upper country rocky. Underbrush is dense along the river, but sparser on the upland. The timber is mainly hemlock, lovely fir, and red fir, all of poor quality, being small and scrubby.

The timber in this township can be logged to Hoh River, although this is of no value as a logging stream, being very rapid with many deep canyons. Flumes can, however, be built for its transportation.

Forest conditions in T. 27 N., R. 8 W.

Timbered area	acres..	6,080
Rocky area	do...	13,440
Mountain meadows	do...	3,520
Total stand of timber	feet B. M..	67,000,000
Average stand per acre	do...	11,000
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 47 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	25	110	25	18	2	5	155
Hemlock	18¾	75	16	12	4	16	127
Lovely fir	23¼	79	17	13	4	20	131

TOWNSHIP 27 NORTH, RANGE 9 WEST.

This township consists almost entirely of mountainous, rugged country. The north half drains to Hoh River, which flows across its northern edge in a narrow valley. The south half is drained by tributaries of the South Fork of Hoh River. Nearly three-fourths of the township lies above timber line and is open and grassy.

The timber consists mainly of hemlock and lovely fir, 40 per cent of which is of good quality. The remainder is small and stunted. There is along Hoh River a little good red fir and cedar.

The soil consists of clay and gravel. The underbrush is dense along Hoh River, consisting of huckleberry, salal, salmon berry, vine maple, and alder.

The timber, which lies almost entirely upon the portion sloping to Hoh River, can all be logged to that stream, which is, however, of no value as a logging stream, on account of its low banks and many sand bars; still, along its bank there is an easy grade for a railroad, which can be cheaply built.

Forest conditions in T. 27 N., R. 9 W.

Timbered area	acres..	10,560
Rocky and barren area	do...	9,384
Mountain meadows	do...	7,916
Total stand of timber	feet B. M..	273,000,000
Average stand per acre	do...	25,800
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 27 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	45	117	35	28	2	9	157
Cedar	16	66	19	16	8	35	130
Hemlock	129	91	22	19	5	22	137
Lovely fir	83	89	21	18	5	19	131

A. SPRUCE AND HEMLOCK GROWING FROM ONE STUMP.

B. LOVELY FIR.

TOWNSHIP 27 NORTH, RANGE 10 WEST.

This township is drained mainly by Hoh River. Its surface is steep and mountainous, with the exception of a tract of bench land at the forks of Hoh River. The soil is clay and gravel, and the underbrush is dense. The timber consists mainly of hemlock, red fir, and lovely fir, with a little spruce and a trifling amount of cedar. The fir and spruce are of excellent quality. The hemlock and lovely fir are of little value, being very scrubby, especially on the divides.

The timber in this township, with the exception of a small tract along the north line, can be logged to Hoh River, which here is a poor logging stream with low banks and many sand bars. A railroad can, however, be extended up Hoh River with easy grades and thus serve as an outlet.

Forest conditions in T. 27 N., R. 10 W.

Timbered area	acres..	22,685
Mountain meadows	do...	355
Total stand of timber	feet B. M..	994,250,000
Average stand per acre	do...	43,800
Depth of humus	inches..	3
Litter		Medium

Statistics of forest trees in T. 27 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	295	186	48	51	1	3	242
Cedar	6¾	100	20	16	4	14	200
Hemlock	386	122	19	20	1	3	126
Spruce	60½	202	55	41	1	3	220
Lovely fir	246	108	16	24	1	3	129

TOWNSHIP 27 NORTH, RANGE 11 WEST.

This township slopes on the north to the valley of the Bogachiel and on the south to that of Hoh River. Its surface is steeply rolling and broken, with some bottom land along Hoh River. The soil is clay, gravel, and loam. The underbrush is dense. The timber, consisting of hemlock, lovely fir, and red fir, with a little cedar and spruce, is of excellent quality, excepting the cedar, which is small. That on the southern part of the township can be logged to Hoh River, a good driving stream. The northern part should go to the valley of the Bogachiel. This stream is of no value for driving, and the lumber will have to be taken out by rail.

Forest conditions in T. 27 N., R. 11 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	843,000,000
Average stand per acre	do...	36,200
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 27 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	134	187	52	56	2	4	230
Cedar	36½	121	43	23	4	21	231
Hemlock	383	119	16	22	3	5	138
Spruce	64¼	200	65	40	2	4	213
Lovely fir	225¼	108	15	25	2	4	127

TOWNSHIP 27 NORTH, RANGE 12 WEST.

The northern part of this township is drained by Bogachiel River and the southern part by Hoh River. The surface is steeply rolling, with bottom land along the rivers. The soil is clay and loam, and the underbrush is dense. The timber, all of good quality, consists chiefly of hemlock, cedar, and lovely fir, with a little spruce and red fir intermixed. The fir and spruce in the immediate valleys of the rivers are exceptionally large and fine.

The timber in the southern part of this township can be logged to Hoh River, which is a good driving stream. That in the northern part can be logged to the valley of the Bogachiel, but will have to be taken out by rail, as the stream is not drivable.

Forest conditions in T. 27 N., R. 12 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	738,000,000
Average stand per acre	do...	32,000
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 27 N., R. 12 W.

Species	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	32	209	48	57	5	4	227
Cedar	146½	121	49	29	7	31	239
Hemlock	413	138	16	28	4	4	141
Spruce	37½	193	56	51	8	4	218
Lovely fir	109	162	25	36	4	4	140

TOWNSHIP 27 NORTH, RANGE 13 WEST.

The surface of this township is rolling and broken, comprising an alternation of steep ridges and deep valleys. The soil is loam and clay. The underbrush is dense. The timber consists of hemlock, cedar, and lovely fir, with a little spruce. The cedar is of poor quality. The other species are excellent.

With the exception of a small area in the northeast corner, which can be logged into Bogachiel River, the timber on this township should be logged westward down the valleys of the creeks toward the coast, but as there is no harbor on this coast it will be necessary to build a railroad from some inland point to carry out the timber or the sawed lumber.

Forest conditions in T. 27 N., R. 13 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	1,015,500,000
Average stand per acre	do...	44,100
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 27 N., R. 13 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	306	109	52	24	7	43	222
Hemlock	493	131	21	24	5	8	150
Spruce	65	175	46	48	3	5	175
Lovely fir	151½	158	33	40	3	15	160

TOWNSHIP 27 NORTH, RANGE 14 WEST.

This township lies in the western part of the reserve, on the Pacific coast, and comprises the equivalent of 24½ sections. Its surface is rolling and broken, with a bluff, rocky coast. Its soil is clay and loam. The underbrush is dense. The timber is chiefly hemlock, with some spruce and cedar. The spruce is large and excellent, but the other species are second class. Owing to the rocky character of the coast and the absence of any harbor, it will be necessary to ship this timber by railroad from some point in the interior.

Forest conditions in T. 27 N., R. 14 W.

Timbered area	acres..	15,680
Total stand of timber	feet B. M..	634,750,000
Average stand per acre	do...	40,500
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 27 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	83	145	53	28	8	22	205
Hemlock	464	134	21	23	5	8	148
Spruce	87¾	191	51	53	2	4	187

TOWNSHIP 27 NORTH, RANGE 15 WEST.

This is a fractional township, lying on the north Pacific coast, comprising less than a square mile.

Forest conditions in T. 27 N., R. 15 W.

Timbered area	acres..	600
Total stand of timber	feet B. M..	13,750,000
Average stand per acre	do...	22,900

Statistics of forest trees in T. 27 N., R. 15 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	¾	100	44	22	8	40	200
Hemlock	12	125	20	22	6	10	140
Spruce	1	175	44	40	4	6	177

TOWNSHIP 28 NORTH, RANGE 3 WEST.

This township is situated on the eastern border of the reserve. It is drained in part by Dungeness River and in part by the Little Quilcene. Its surface is mountainous and rugged. The soil is clayey and sandy, being derived from underlying slates and sandstones. The underbrush is scanty. This township is well timbered with a good quality of fir, hemlock, and lovely fir, with a little cedar. The timber from the eastern part of it can be logged to Quilcene River by means of skid roads; that from the western part to Dungeness River in a similar manner.

Forest conditions in T. 28 N., R. 3 W.

Timbered area	acres..	16,420
Rocky and broken area	do...	640
Burned area	do...	5,970
Mountain meadows	do...	640
Total stand of timber	feet B. M..	641,250,000
Average stand per acre	do...	39,000
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 28 N., R. 3 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	155	179	30	44	14	8	198
Cedar	32¼	128	25	27	32	22	151
Hemlock	266	143	20	24	28	15	122
Lovely fir	188	137	21	29	34	19	125

TOWNSHIP 28 NORTH, RANGE 4 WEST.

This township is situated in the eastern part of the reserve and is drained by Dungeness River. The surface of the township is mountainous and rugged. The soil is clay and sand, being derived from underlying slates and sandstones. The underbrush is scanty. The township is sparsely timbered with hemlock and lovely fir. The timber in the township can be logged to Dungeness River by means of skid roads.

Forest conditions in T. 28 N., R. 4 W.

Timbered area	acres..	13,120
Rocky and broken area	do...	3,840
Burned area	do...	3,200
Mountain meadows	do...	2,880
Total stand of timber	feet B. M..	50,500,000
Average stand per acre	do...	4,000
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 28 N., R. 4 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	19	60	16	11	7	28	101
Lovely fir	31½	63	16	14	7	26	103

TOWNSHIP 28 NORTH, RANGE 5 WEST.

This township, situated in the eastern part of the reserve, is drained by Dungeness River and its branches. Its surface is entirely mountainous and broken. Its soil is derived from sandstones and slates. Underbrush is light. The timber consists of a scrubby growth of hemlock and lovely fir, much of which on the east side of the township has been burned. The timber can be logged to the valleys of the branches of Dungeness River, up which skid roads or tramways may be built.

Forest conditions in T. 28 N., R. 5 W.

Timbered area	acres	17,000
Rocky area	do	1,920
Burned area	do	640
Mountain meadows	do	4,480
Total stand of timber	feet B. M.	83,500,000
Average stand per acre	do	4,900
Depth of humus	inches	2
Litter		Light.

Statistics of forest trees in T. 28 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Hemlock	30	62	16	11	5	30	111
Lovely fir	53½	69	18	14	4	28	118

TOWNSHIP 28 NORTH, RANGE 6 WEST.

This township, situated in the eastern part of the reserve, is mainly composed of high mountains drained by Elwha River and its branch, Lillian Creek. The soil is chiefly clay derived from underlying slates. The underbrush is light, and along Elwha River has been mainly burned away. Over large areas the timber as well as the underbrush has been destroyed by fire. The timber consists of fir, hemlock, and lovely fir, nearly all of poor quality.

This timber can in the main be logged to the valley of Elwha River, but as that river and its branch, Lillian Creek, are of no value for driving purposes, it will be necessary to handle the timber with chutes or flumes; consequently, it will be expensive to log this township.

Forest conditions in T. 28 N., R. 6 W.

Timbered area	acres	13,760
Rocky area	do	960
Burned area	do	3,840
Mountain meadows	do	4,480
Total stand of timber	feet B. M.	143,000,000
Average stand per acre	do	10,900
Depth of humus	inches	2
Litter		Light.

Statistics of forest trees in T. 28 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	49	128	26	28	5	6	150
Hemlock	52	65	17	14	7	16	103
Lovely fir	42	64	17	15	7	16	105

TOWNSHIP 28 NORTH, RANGE 7 WEST.

This township is drained by Elwha River and Cat Creek. Its surface is mountainous throughout. Its soil is clay and gravel. Underbrush is light. The timber, which is very light, consists of hemlock, fir, and lovely fir, all of poor quality, having to a large extent been destroyed by fire.

The timber can be logged to Elwha River, although that is a poor logging stream, with low banks and many canyons and gravel bars. It is probable that flumes would have to be constructed along the river to carry the timber out.

Forest conditions in T. 28 N., R. 7 W.

Timbered area	acres..	16,000
Barren area	do...	1,280
Burned area	do...	3,840
Mountain meadows	do...	1,920
Total stand of timber	feet B. M..	177,500,000
Average stand per acre	do...	11,100
Humus	inches..	2
Litter		Medium.

Statistics of forest trees in T. 28 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	59½	159	29	22	13	6	185
Hemlock	71	113	17	16	13	8	124
Lovely fir	47	108	18	15	10	9	121

TOWNSHIP 28 NORTH, RANGE 8 WEST.

This township is all rugged and mountainous. It is drained on the south by Hoh River, on the north by Cat Creek and the Soleduck, whose headwaters it includes. The soil is mainly coarse and gravelly. Underbrush is dense along the rivers, while on the uplands it is light, the high divides consisting of open grass land. The timber is chiefly fir, with some hemlock and lovely fir, and a few scattering cedars. It is in the main of poor quality.

The timber in the southern part of this township can be logged to Hoh River: on the east it can be sent down Cat Creek to the Elwha, and on the west to the Soleduck, but owing to the mountainous character of the township logging will be extremely expensive.

Forest conditions in T. 28 N., R. 8 W.

Timbered area	acres..	15,552
Rocky area	do...	2,400
Grazing area	do...	4,960
Burned area	do...	128
Total stand of timber	feet B. M..	207,750,000
Average stand per acre	do...	13,400
Humus	inches..	2
Litter		Medium.

Statistics of forest trees in T. 28 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	112	157	32	38	3	4	198
Cedar	4	51	18	14	7	29	104
Hemlock	53¼	68	16	13	5	38	106
Lovely fir	38½	63	17	14	5	39	102

TOWNSHIP 28 NORTH, RANGE 9 WEST.

This township is drained by Soleduck, Hoh, and Bogachiel rivers. Most of it lies very high and it is all mountainous and broken. The soil is stony. Underbrush is scanty on the uplands, but dense in the narrow river valleys.

The timber consists mainly of hemlock and lovely fir, with a trifling amount of red fir. The latter is of good quality, but the hemlock and lovely fir are scrubby and of no value.

The timber can be logged to the rivers by which the township is drained. They are, however, poor logging streams, and it is not probable that the small amount of timber in the township will ever tempt lumbermen to bring a railroad into it.

Forest conditions in T. 28 N., R. 9 W.

Timbered area	acres..	25,778
Rocky area	do...	128
Mountain meadows	do...	1,742
Burned area	do...	192
Total stand of timber	feet B. M..	266,750,000
Average stand per acre	do...	10,300
Depth of humus	inches..	2
Litter		Light.

A. CEDAR 6 FEET IN DIAMETER.

B. SPRUCE NEAR LAKE QUENIULT.

Statistics of forest trees in T. 28 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	18	84	24	19	2	9	133
Cedar	1	45	13	8	3	40	100
Hemlock	137¾	66	19	15	4	12	103
Lovely fir	110	68	17	14	5	15	105

TOWNSHIP 28 NORTH, RANGE 10 WEST.

This township is drained by Bogachiel River and the South Fork of the Kalawa. It is nearly all a mountainous region, sloping to the west, with narrow valleys along the rivers. The soil is clay and gravel. The underbrush is dense in the valleys but sparse upon the ridges. The timber is mainly hemlock and lovely fir, most of it being of good quality. There is a little red fir also, of fine quality.

This township, with the exception of a small tract in the northwest corner which can be logged to Kalawa River, can be logged to the Bogachiel, although this is a poor logging stream, with low banks and not sufficient water for driving. The valley, however, furnishes an excellent route for a railroad, which will probably be the method employed for clearing the township.

Forest conditions in T. 28 N., R. 10 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	539,500,000
Average stand per acre	do...	23,400
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 28 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	40½	104	21	20	3	4	133
Hemlock	262	113	19	15	3	5	126
Spruce	7	129	36	26	3	5	144
Lovely fir	230	115	19	14	3	5	127

TOWNSHIP 28 NORTH, RANGE 11 WEST.

This township is drained to the westward by the Bogachiel and Kalawa rivers. It consists of mountainous spurs running nearly east and west, with narrow valleys along the streams. The soil is red clay in the upland and loam along the rivers.

The underbrush is dense in the valleys and sparse upon the ridges. The timber consists mainly of hemlock, red and lovely fir, with a little spruce and cedar.

The timber can be logged to the Bogachiel and Kalawa rivers, but as they are poor driving streams it is probable that it will be necessary to construct railroads to get the lumber out. It will be an expensive township to log on account of the steepness and ruggedness of the ridges.

Forest conditions in T. 28 N., R. 11 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	811,500,000
Average stand per acre	do...	35,300
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 28 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	140	177	37	35	2	3	203
Cedar	10½	100	38	21	5	17	206
Hemlock	428	126	21	22	2	3	132
Spruce	27	175	44	30	2	5	190
Lovely fir	206	144	28	34	2	3	150

TOWNSHIP 28 NORTH, RANGE 12 WEST.

This township is drained by the Kalawa and Bogachiel rivers, and consists almost entirely of rugged mountain ridges. The soil is mainly clay. The underbrush, as everywhere else, is dense in the valleys and sparse upon the ridges. The timber is chiefly hemlock and lovely fir, with some red fir, spruce, and cedar scattered through it. The stand is extremely heavy and the timber of all kinds is of good quality.

The timber may be logged to the rivers, but as they are poor driving streams it is probable that it will be found necessary to build railroads up their valleys for the purpose of getting the lumber out.

Forest conditions in T. 28 N., R. 12 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	1,050,500,000
Average stand per acre	do...	45,600
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 28 N., R. 12 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	98	199	40	49	3	5	229
Cedar	27	128	45	26	6	15	209
Hemlock	555	141	24	34	2	4	151
Spruce	43½	215	56	56	2	4	213
Lovely fir	327	147	28	41	2	4	151

TOWNSHIP 28 NORTH, RANGE 13 WEST.

This township, lying toward the western part of the reserve, is made up in considerable part of low bottom land along Kalawa and Bogachiel rivers, rising to the south in somewhat broken ridges. The soil is clay and sandy loam, and gravel on the ridges. The underbrush is dense. The township has a heavy stand of timber, consisting in the main of hemlock, red fir, spruce, and lovely fir, with a little cedar. It is nearly all of good quality.

The timber can be logged to Kalawa and Bogachiel rivers, which are good driving streams, and the area can be logged quite cheaply.

Forest conditions in T. 28 N., R 13 W.

Timbered area	acres..	21,580
Forks Prairie	do...	1,460
Total stand of timber	feet B. M..	951,500,000
Average stand per acre	do...	44,100
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 28, N., R. 13 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	131	219	44	46	5	7	223
Cedar	31½	129	40	24	8	25	179
Hemlock	512	125	21	27	5	7	115
Spruce	152	184	47	51	3	5	153
Lovely fir	125	148	30	43	3	4	157

TOWNSHIP 28 NORTH, RANGE 14 WEST.

This township lies in the valley of Soleduck and Dickey rivers and consists in the main of gently rolling bench and bottom lands. The soil is commonly clay and loam, with clay and gravel in the uplands. The underbrush is dense everywhere. The timber consists mainly of hemlock and spruce, with a little fir and scattering cedar, all of good quality. The spruce timber is found along the rivers and is large and valuable.

The timber can be logged to the rivers which traverse it, which are good logging streams at all seasons of the year, and timber can be gotton out very cheaply. This township contains considerable areas of prairie land lying between Soleduck and Dickey rivers. The largest of these areas is that known as Quillayute Prairie.

Forest conditions in T. 28 N., R. 14 W.

Timbered area	acres..	21,370
Prairie area	do...	1,670
Total stand of timber	feet B. M..	722,000,000
Average stand per acre	do...	33,800
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 28 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	50	192	45	47	5	6	305
Cedar	14½	131	28	21	7	23	174
Hemlock	350½	124	19	22	5	8	141
Spruce	307	183	55	58	3	5	188

TOWNSHIP 28 NORTH, RANGE 15 WEST.

This fractional township lies upon the Pacific coast, at the mouth of Quillayute River. Its surface is in the main gently rolling, consisting of bottom and bench lands of the river. The soil is of clay and sandy loam. The underbrush is extremely dense. The timber consists mainly of hemlock, with some spruce and cedar. The spruce is good quality, but the cedar and hemlock are second rate.

The timber, with the exception of a small tract in the southeast corner of the township, can be logged to Quillayute River, which is a good logging stream; but as there is no harbor at its mouth it will be necessary to mill the timber within the township.

Forest conditions in T. 28 N., R. 15 W.

Timbered area	acres..	13,765
Prairie area	do...	235
Total stand of timber	feet B. M..	318,500,000
Average stand per acre	do...	23,100
Depth of humus	inches..	3
Litter		Heavy.

CEDAR.

Statistics of forest trees in T. 28 N., R. 15 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	14	111	44	22	8	24	200
Hemlock	251	126	21	24	7	9	135
Spruce	53½	159	41	33	4	7	183

TOWNSHIP 29 NORTH, RANGE 3 WEST.

This township, in the eastern part of the reserve, is composed of rolling bench land, which becomes steep on the west, sloping down to the valley of Dungeness River. The soil is mainly clay. The underbrush is dense. On the south and west of this township the timber has all been killed by fire and is standing in good condition. If cut immediately it will make excellent lumber, but is in constant danger of destruction by fire.

The timber consists chiefly of fir of excellent quality. With it there is some cedar and hemlock, but it is small and poor.

The timber, with the exception of a small part in the west sloping to Dungeness River, can be logged to Squim Bay, in the northeast corner of the township, and can be taken out very cheaply.

Forest conditions in T. 29 N., R. 3 W.

Timbered area	acres..	15,150
Burned area	do...	6,890
Total stand of timber	feet B. M..	739,250,000
Average stand per acre	do...	48,700
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 29 N., R. 3 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	506	183	39	49	33	14	214
Cedar	24¾	123	31	26	50	22	209
Hemlock	208½	135	23	26	38	19	137

TOWNSHIP 29 NORTH, RANGE 4 WEST.

This township, situated in the northeastern part of the reserve, has been greatly burned over. It is drained by Dungeness River and McDonald Creek. It consists of high, rolling country sloping toward the north. The soil is clay and gravel on the north, changing to a stony soil in the south. Underbrush is very dense. The timber on this township is mainly fir and cedar, with a little hemlock. The fir timber is small except in the eastern part of the township, where it is large and of good quality. Most of this township has been burned over, and the timber left standing is scattered in small bodies.

The timber in the eastern part of this township can be logged to Dungeness River, although this is a poor logging stream, with low banks and many gravel bars. A railroad could be built up its valley at slight expense, however. The timber in the western part can be logged by way of McDonald Creek, using skid roads.

The valley of Dungeness River has been to a large extent cleared and is thickly settled.

Forest conditions in T. 29 N., R. 4 W.

Timbered area	acres..	9,280
Burned area	do...	13,440
Grazing area	do...	320
Total stand of timber	feet B. M..	217,750,000
Average stand per acre	do...	23,400
Humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 29 N., R. 4 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	132¾	161	35	38	27	9	193
Cedar	72¾	106	22	22	70	23	161
Hemlock	12¼	98	16	27	31	10	133

TOWNSHIP 29 NORTH, RANGE 5 WEST.

The southern part of this township is very steep and mountainous, descending northward into a rolling country. The soil in the northern and lower part is gravelly clay, while in the mountainous southern portion it is coarse gravel. The underbrush is dense on the north, becoming sparser southward. The timber consists mainly of fir and hemlock, with a little cedar and lovely fir. The fir is of good quality. The other timber is of little value.

The timber of this township can be logged northward by means of skid roads or tramways.

Forest conditions in T. 29 N., R. 5 W.

Timbered area	acres..	15,360
Burned area	do...	7,040
Rocky area	do...	640
Grazing area	do...	640

Total stand of timber .... feet B. M..	360, 250, 000
Average stand per acre .... do...	23, 500
Depth of humus .... inches..	2
Litter	Medium.

Statistics of forest trees in T. 29 N., R. 5 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	169	170	30	41	16	9	198
Cedar	20¼	125	23	23	30	23	188
Hemlock	119	109	15	19	20	11	144
Lovely fir	52	96	20	18	9	9	139

TOWNSHIP 29 NORTH, RANGE 6 WEST.

This township lies in the northeastern part of the reserve, and is made up entirely of mountainous and rugged country of little value except for grazing purposes. The soil is thin and stony. The underbrush is light, excepting in the immediate gorges of three or four creeks. The timber consists chiefly of fir and hemlock, with a little lovely fir and scattering cedars. The fir is of good quality, but the hemlock and lovely fir are poor.

The timber of this township can mainly be logged to Morse Creek on the east side.

Forest conditions in T. 29 N., R. 6 W.

Timbered area .... acres..	13, 749
Barren rocky area .... do...	896
Burned area .... do...	3, 435
Mountain meadows .... do...	4, 960
Total stand of timber .... feet B. M..	265, 000, 000
Average stand per acre .... do...	19, 000
Depth of humus .... inches..	2
Litter	Medium.

Statistics of forest trees in T. 29 N., R. 6 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	107	174	31	48	9	8	204
Cedar	5½	....	....	....	12	....	200
Hemlock	93	88	17	16	10	8	130
Lovely fir	59½	83	19	18	7	8	133

TOWNSHIP 29 NORTH, RANGE 7 WEST.

This township is steep and mountainous, with the exception of a narrow strip along Elwha River. The soil is clay and gravel and it is very stony. The underbrush is dense along the river, but on the uplands it is light. The timber is chiefly fir and hemlock and is of second quality.

Most of the timber can be logged to Elwha River. This is a poor logging stream, but along its valley a railroad could be built for the purpose of transporting logs.

Forest conditions in T. 29 N., R. 7 W.

Timbered area	acres..	20,900
Rocky area	do...	64
Burned area	do...	980
Mountain meadows	do...	1,100
Total stand of timber	feet B. M..	196,500,000
Average stand per acre	do...	9,400
Depth of humus	inch..	1
Litter		Light.

Statistics of forest trees in T. 29 N., R. 7 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	109	140	30	29	8	9	181
Cedar	9	84	31	19	15	23	177
Hemlock	69½	78	18	17	7	9	134
Lovely fir	9	91	19	18	7	8	139

TOWNSHIP 29 NORTH, RANGE 8 WEST.

This township, drained by Boulder and Barnes creeks, is entirely mountainous and broken. Parts of its area are rocky and without vegetation; other parts, lying above the limit of timber, are composed of high grass lands, while the timber is found on the slopes of the ridges and in the valleys of creeks. The underbrush is heavy in the valleys and becomes sparser on the ridges. The timber consists of lovely fir, hemlock, and a little red fir, all of poor quality.

The timber can be logged on the north to Lake Crescent by way of Barnes Creek, and on the south down Boulder Creek into Elwha River. It will be very expensive getting the timber out of this township, as, owing to the steepness of the ridges, it will have to be run down by chute to the streams.

A. CEDAR.

B. SKID ROAD.

Forest conditions in T. 29 N., R. 8 W.

Timbered area	acres..	20,480
Rocky area	do...	640
Mountain meadows	do...	1,920
Total stand of timber	feet B. M..	288,500,000
Average stand per acre	do...	14,100
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 29 N., R. 8 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	18½	105	21	21	2	6	142
Hemlock	117½	76	18	14	3	9	122
Lovely fir	152½	84	19	17	3	8	128

TOWNSHIP 29 NORTH, RANGE 9 WEST.

This township is in the main drained by Soleduck River and its north fork. Its area is mountainous, steep, and very rugged. The soil is clay and gravel. The underbrush in the river valleys is dense, but on the uplands is light. The timber is chiefly made up of fir, with considerable hemlock and a trifling amount of other species. The fir is of good quality, except on the high divides, where it becomes small. The hemlock and fir are of poor quality.

The timber can be logged to Soleduck River, with the exception of that in a few sections in the north, which can be logged direct to Lake Crescent. The Soleduck, however, is not a drivable stream, and it will be necessary to construct a railroad up its valley. Outside of the timber in the immediate valley of the Soleduck, this township will be expensive to log, owing to the steepness of the slopes and the ruggedness of the country.

Forest conditions in T. 29 N., R. 9 W.

Timbered area	acres..	27,200
Mountain meadows	do...	640
Total stand of timber	feet B. M..	555,000,000
Average stand per acre	do...	20,400
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 29 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	306½	125	23	27	3	6	160
Cedar	1½	85	20	12	8	15	140
Hemlock	165	83	16	17	5	7	125
Spruce	3	175	40	49	2	4	180
Lovely fir	79	88	18	17	4	6	125

TOWNSHIP 29 NORTH, RANGE 10 WEST.

This township is drained almost entirely by Soleduck River. Its surface is nearly all steep, broken, and rugged, rising to a great elevation in the south part. Soil is clay and gravel. Underbrush is dense. The timber is chiefly fir and hemlock, with a trifling amount of lovely fir. It is all of good quality, and stands very heavy in the northern part of the township.

The timber can be logged to Soleduck River, with the exception of a few sections in the southwest corner, which can best be logged to the Kalawa. It will be expensive to transport the lumber down to the river, owing to the steepness and ruggedness of the country, but it can be done by building skid roads up the main branches of the river and chutes down the hillsides.

Forest conditions in T. 29 N., R. 10 W.

Timbered area	acres..	23,040
Total stand of timber	feet B. M..	862,000,000
Average stand per acre	do...	37,400
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 29 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	345	180	27	32	3	6	198
Cedar	4	100	25	22	8	15	156
Hemlock	418	130	18	25	4	6	134
Spruce	2	180	48	43	2	4	180
Lovely fir	93	138	19	29	3	7	130

TOWNSHIP 29 NORTH, RANGE 11 WEST.

This township is drained mainly by the North Fork of Kalawa River. Its surface is nearly all steep and rolling and broken in the south. The soil is clay and gravel. The underbrush is heavy. It is heavily timbered with hemlock and red fir, some lovely fir, and a trifling amount of spruce and cedar. The timber is good, excepting on the high divides, where the elevation has prevented its development.

This timber can be logged to the North Fork of Kalawa River, with the exception of an area on the south line, which can be logged to the South Fork of Kalawa River.

Forest conditions in T. 29 N., R. 11 W.

Timbered area	acres..	22,440
Burned area	do...	600
Total stand of timber	feet B. M..	889,250,000
Average stand per acre	do...	39,600
Depth of humus	inches..	3
Litter		Medium.

Satistics of forest trees in T. 29 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	255½	215	42	48	7	5	235
Cedar	8	101	29	24	8	19	161
Hemlock	456	133	26	51	11	8	151
Spruce	9¾	207	53	57	15	5	200
Lovely fir	160	141	31	37	4	6	158

TOWNSHIP 29 NORTH, RANGE 12 WEST.

This township is drained in the main by the North Fork of Kalawa River. Its surface is very steep and broken, with the exception of the north tier of sections, which consist of gently rolling land. Soil is clay and gravel along the creeks and rivers, while on the uplands it is stony. Underbrush is dense. The timber consists mainly of hemlock and red fir, with some lovely fir and spruce and a little cedar, all of good quality.

This timber, with the exception of that in the northern portion, can be logged into the North Fork of Kalawa River, although this is a poor logging stream, with low banks and insufficient water for driving. A better plan for logging the township would be to construct a railroad in the valley of this stream. The timber would, however, in any case be expensive to handle, requiring chutes to transport it to the railroad or the river.

Forest conditions in T. 29 N., R. 12 W.

Timbered area	acres..	22, 240
Burned area	do...	800
Total stand of timber	feet B. M..	1, 152, 500, 000
Average stand per acre	do...	51, 800
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 29 N., R. 12 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	387	219	45	59	5	8	221
Cedar	22½	134	43	25	9	18	204
Hemlock	519	137	22	29	7	10	143
Spruce	99	211	66	69	7	5	214
Lovely fir	125	140	26	35	3	5	149

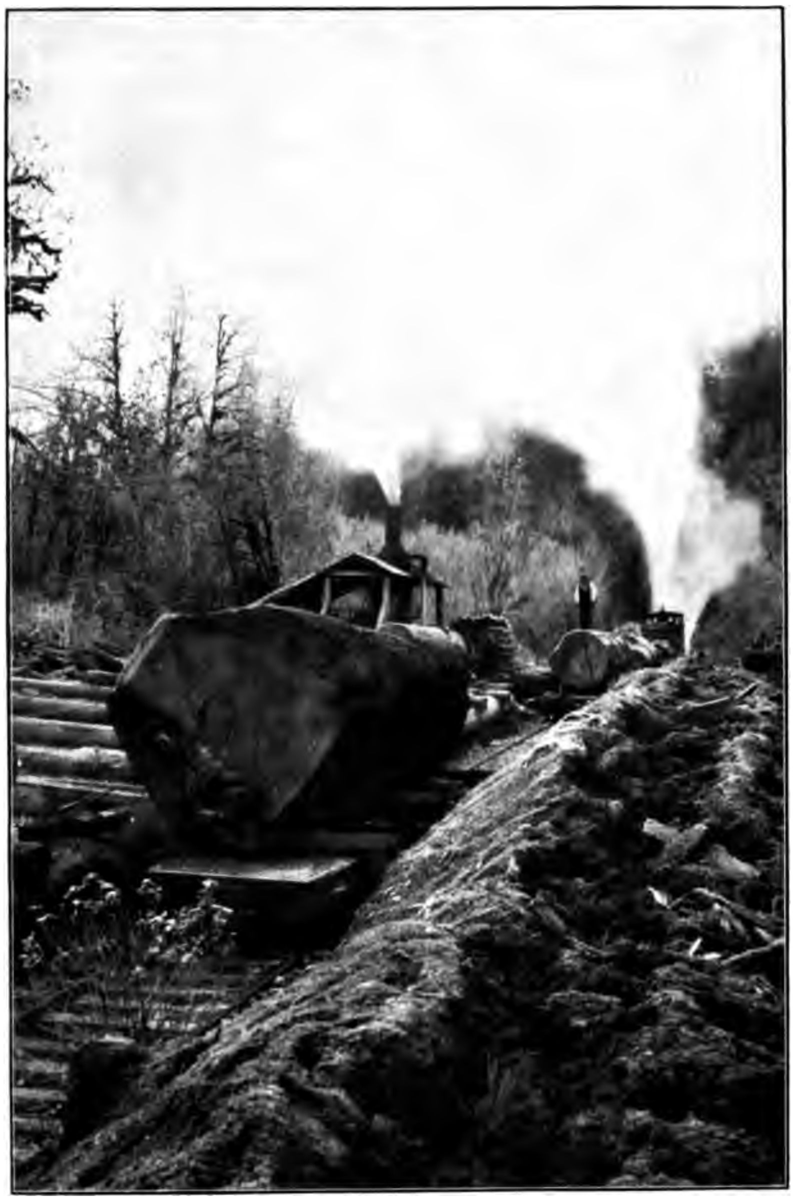
TOWNSHIP 29 NORTH, RANGE 13 WEST.

This township is drained mainly by Soleduck River, which flows through the middle. A small part in the southeast is drained by the Kalawa and in the northwest by Dickey River. The valley of the Soleduck contains much timbered bottom land and two small prairies, Shuwah and Maxfield, and considerable areas of the township have been burned. The country between the rivers is steep, rolling, and broken in the eastern part of the township, while in the western part it is gently sloping. The soil is clay and loam on the bottom lands, while the uplands are gravelly. Underbrush is everywhere dense. The timber is chiefly fir, spruce, and hemlock, all of good quality. The fir stands very heavily along Soleduck and Kalawa rivers. The hemlock is found mostly in the eastern part of the township, on the high ridges. Cedar is very scattering in this township and is of poor quality.

The timber can be logged into Soleduck River, with the exception of a small tract in the northwest corner, from which the timber should be taken to the East Fork of Dickey River, and another small portion in the southeast, which should go to the Kalawa River. The last is a good logging stream during winter season.

Forest conditions in T. 29 N., R. 13 W.

Timbered area	acres..	21, 960
Burned area	do...	800
Prairie area	do...	280
Total stand of timber	feet B. M..	1, 086, 000, 000
Average stand per acre	do...	49, 500
Depth of humus	inches..	3
Litter		Medium.



LOADING LOGS ON RAILWAY.

Statistics of forest trees in T. 29 N., R. 13 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	384	206	46	57	6	9	220
Cedar	4	122	46	30	9	34	211
Hemlock	454	120	19	22	5	9	147
Spruce	196½	195	57	61	3	5	193
Lovely fir	47½	151	28	32	3	5	158

TOWNSHIP 29 NORTH, RANGE 14 WEST.

This township is drained by the East and West forks of Dickey River. Along the east streams and other branches is some timbered bottom land, while between them the country is steep and rugged. The soil is clay and loam along the rivers and in the swamps, while the uplands have gravel and clay soils. Underbrush is everywhere dense.

The timber is mainly hemlock, spruce, and cedar, more than half being hemlock. This and the spruce are of good quality. The cedar is large but overripe, most of it having dead tops. There is a small amount of fir in the township, mainly in the east tier of sections.

The timber can all be logged to Dickey River, which is a good logging stream below the forks in winter. It can also be logged cheaply with tramways and railroads built up the valleys of the river and its branches.

Forest conditions in T. 29 N., R. 14 W.

Timbered area	acres..	23,000
Total stand of timber	feet B. M..	788,000,000
Average stand per acre	do...	34,300
Humus	inches..	4
Litter		Heavy.

Statistics of forest trees in T. 29 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	19	211	48	53	5	8	215
Cedar	78½	142	47	23	9	23	195
Hemlock	471½	127	20	22	5	9	150
Spruce	219	189	57	65	2	5	190

TOWNSHIP 29 NORTH, RANGE 15 WEST.

This township borders on the Pacific coast, the coast line running through the west tier of sections. It also contains the south end of Ozette Lake. The surface is rolling and the banks of some of the creeks are steep. It contains numerous swamps covered with a thick growth of cedar. The soil is a deep, red clay loam.

The timber consists of hemlock, cedar, and spruce of second-class quality. The cedar is in the main very large, but has hollow trunks, and most of the trees are dead at the top. Hemlock is mostly small. Spruce is rough and knotty and stands mostly along the coast, although in some cases along the banks of the creeks. The timber in the eastern part of this township can be logged to Dickey River, that in the northern to Ozette Lake, and that in the western to the Pacific.

Forest conditions in T. 29 N., R. 15 W.

Timbered area	acres..	19,200
Total stand of timber	feet B. M..	744,750,000
Average stand per acre	do...	38,800
Depth of humus	inches..	3
Litter		Heavy.

Statistics of forest trees in T. 29 N., R. 15 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	228¾	107	46	22	9	28	210
Hemlock	367	123	19	20	5	9	152
Spruce	149	180	51	50	3	5	149

TOWNSHIP 30 NORTH, RANGE 9 WEST.

This township, lying in the northern part of the reserve, includes nearly all of Lake Crescent. The surface of the township is rugged and mountainous, the only exception being along the north line and the valley of Lyre River. The soil is clay in the lowlands and gravel upon the mountains. Underbrush is very dense. This township is heavily timbered, mainly with fir and hemlock, with a little cedar and spruce.

The timber can all be logged to Lake Crescent and Lyre River, with the exception of a small tract in the western part, which is tributary to the East Twin River. At present the Seattle Logging Company has a logging railroad built from Port Crescent, on the Strait of Juan de Fuca, to a point near the north line of this township, its intention having been to continue this road along Lyre River to the outlet of the lake, when all the timber tributary to the lake can be logged into Lake Crescent and hence towed in rafts to the end of the railroad.

Forest conditions in T. 30 N., R. 9 W.

Timbered area	acres..	22,336
Lake area	do...	4,352
Burned area	do...	1,115
Total stand of timber	feet B. M..	876,250,000
Average stand per acre	do...	40,000
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 30 N., R. 9 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	549¾	170	36	45	5	7	194
Cedar	48½	115	31	24	9	25	162
Hemlock	203½	122	16	23	6	9	138
Spruce	16½	174	45	54	2	5	192
Lovely fir	58	163	34	47	2	6	166

TOWNSHIP 30 NORTH, RANGE 10 WEST.

This township is in the northern tier of the reserve. Its surface is steep and mountainous, with the exception of a strip of bench land in the southern part along Soleduck River. The soil consists of gravel and clay, while the high divides are very stony. Underbrush is dense.

Timber consists mostly of fir and hemlock. The fir is all of good quality, and in the western part of the township is all large. Most of the hemlock is small in size and of second class. Along the south line of this township is a small amount of western white pine of good quality. More than half of this township, including the entire northwestern portion, has been burned over, destroying nearly all the timber.

The timber in this township can in the main be logged to Soleduck River, which is a good logging stream during the winter season, while the northern part of it can be logged by means of a railroad to be built from Lake Crescent.

Forest conditions in T. 30 N., R. 10 W.

Timbered area	acres..	8,685
Burned area	do...	14,355
Total stand of timber	feet B. M..	397,500
Average stand per acre	do...	45,800
Depth of humus	inches..	2
Litter		Heavy.

Statistics of forest trees in T. 30 N., R. 10 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Fir	228	213	46	52	19	5	236
Cedar	9	104	34	22	6	7	200
Hemlock	160½	128	23	30	26	6	145

TOWNSHIP 30 NORTH, RANGE 11 WEST.

This township lies in the northern part of the reserve. Its surface is broken and very rugged, excepting in the southern part, along Soleduck River, which is gently rolling. Its soil is clay or gravel along the river, while the upland is very rugged. Underbrush is dense everywhere.

The timber consists chiefly of fir of good quality. The cedar and hemlock are scattering and of poor quality, having been to a large extent destroyed by fire. The spruce is good and is found only in small amounts along Soleduck River and Bear Creek.

The timber in this township can all be logged into Soleduck River, with the exception of a small tract in the northern part of the township which can be logged into Pysht River. The timber in that part of the township which can be logged into the Soleduck can be gotten out very cheaply; that along Bear Creek, however, just to the north, will be somewhat expensive, as it will be necessary to build a railroad or tramway to the timber.

Two-thirds of the area of this township, including practically all of the high land outside of the immediate valley of the Soleduck, has been burned, being part of one of the great burns of this region.

Forest conditions in T. 30 N., R. 11 W.

Timbered area	acres	7,935
Burned area	do	15,105
Total stand of timber	feet B. M.	375,250,000
Average stand per acre	do	47,400
Depth of humus	inches	
Litter		Heavy.

Statistics of forest trees in T. 30 N., R. 11 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Year.*
Red fir	216	218	41	73	10	8	217
Cedar	19¼	127	41	28	11	19	199
Hemlock	104	128	21	25	15	11	145
Spruce	22	198	59	59	12	6	201
Lovely fir	14	137	19	30	8	7	147

TRAIN OF LOGS ON NORTHERN PACIFIC RAILWAY.

TOWNSHIP 30 NORTH, RANGE 12 WEST.

The northern part of this township, which is one of the northern tier of townships of the reserve, is steep, broken, and rocky, descending southward to the valley of Soleduck River, which is mostly level bench land. The underbrush is dense and varied in character. The timber consists mainly of red fir, hemlock, and spruce, with but little cedar or lovely fir. The fir and spruce are of good quality, but have to a large extent been destroyed by fire. The hemlock is small and poor. The cedar is very scattering, and found mostly along the streams.

The timber in this township can all be logged to Soleduck River, which is a good logging stream during the winter season. The work of moving the timber from the northern part of the township will, however, be somewhat expensive, owing to the rugged character of the country.

Forest conditions in T. 30 N., R. 12 W.

Timbered area	acres..	17,165
Burned area	do...	5,750
Prairie area	do...	125
Total stand of timber	feet B. M..	746,000,000
Average stand per acre	do...	43,400
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 30 N., R. 12 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	413	238	51	70	29	10	231
Cedar	15½	129	45	28	22	20	180
Hemlock	191½	126	20	31	24	9	139
Spruce	84	218	54	72	36	7	211
Lovely fir	42	164	26	47	7	6	165

TOWNSHIP 30 NORTH, RANGE 13 WEST.

This township comprises the headwaters of the East Fork of Dickey River and Hoko River, also a small part of the drainage basin of the Soleduck, including Lake Pleasant. In the eastern part of the township is a heavy ridge, rising to an altitude of 2,540 feet, which is very steep and broken. In the northwestern part the township is also composed of high hills, rising to an altitude of 1,700 feet. The divide separating the East Fork of Dickey River from the Hoko is low, the valleys of the two streams being practically one. About Lake Pleasant in the southeast corner is much level land, including two patches of prairie.

The soil is clay and loam along the rivers, with red clay on the ridges. The prairie land, however, about Lake Pleasant is very gravelly and stony. The underbrush is dense.

The timber consists of fir, cedar, hemlock, and spruce. The fir is abundant in the eastern part of the township and is all of good quality. The cedar, though large, is poor. Hemlock is all good except along the streams, where it is small and poor. The spruce, all of first-class quality and very large, is found near the rivers and about Lake Pleasant.

The timber on the north of the divide, between Hoko and Dickey rivers, can be logged down the valley of Hoko River by means of a railroad, since the river is not large enough to float logs. The southern part of the township can be similarly logged by means of a railroad up the valley of the Dickey. In the southeast corner about Lake Pleasant the timber can be logged directly into the Soleduck, which is a drivable stream.

Forest conditions in T. 30 N., R. 13 W.

Timbered area	acres	21,760
Burned area	do	3,150
Prairie area	do	410
Total stand of timber	feet B. M.	894,750,000
Average stand per acre	do	41,100
Depth of humus	inches	3
Litter		Medium.

Statistics of forest trees in T. 30 N., R. 13 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	74½	243	54	77	14	9	223
Cedar	42¾	144	51	30	20	19	202
Hemlock	394½	105	21	29	17	9	142
Spruce	236½	226	62	81	24	6	209
Lovely fir	146½	143	24	36	5	5	150

TOWNSHIP 30 NORTH, RANGE 14 WEST.

This township lies in the northwestern part of the reserve and contains Dickey Lake near the center, in secs. 9 and 16.

The surface is steeply rolling on the east, rising to a height of 1,500 feet. The western and much the greater part of the township is gentle rolling land, with much level bottom land heavily timbered near the foot of Dickey Lake. The soil is clay and loam in the bottom lands, while the uplands are composed of red clay. Underbrush is very dense.

The timber is chiefly cedar, hemlock, and spruce, more than half the timber on the township being composed of hemlock. This stands heavily in the eastern part of the township and is of good quality, while that on the west is small and poor. The cedar is very large, but poor, being of value only for shingle bolts. The spruce, which is found mainly near Dickey Lake and along the streams, is of good quality. The general outlet for this timber is to the south, down the West Fork of Dickey River. This, however, is not large enough for driving logs, but shingle bolts and small timber can be driven during the winter season. A better outlet, however, would be by way of a railroad crossing the divide above Dickey Lake and going down Hoko River to the Strait of Juan de Fuca.

Forest conditions in T. 30 N., R. 14 W.

Timbered area	acres..	16,000
Burned area	do...	160
Timbered bottom lands	do...	830
Total stand of timber	feet B. M..	883,500,000
Average stand per acre	do...	55,200
Depth of humus	inches..	3
Litter		Light.

Statistics of forest trees in T. 30 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	6	228	54	55	3	6	240
Cedar	200	129	51	24	9	30	216
Hemlock	485	125	21	23	6	9	152
Spruce	132½	182	51	52	3	5	190
Lovely fir	60	157	34	40	2	4	165

TOWNSHIP 30 NORTH, RANGE 15 WEST.

This township, in the northwestern part of the reserve, contains most of Ozette Lake, which comprises approximately the equivalent of eleven sections in the middle of the township. Aside from this lake the area of the township is entirely forested.

The surface is in the main gently rolling, sloping toward the lake on both sides. The soil is clay and loam on the bottom land and on the upland it is red clay. The underbrush is dense.

The timber consists of hemlock, cedar, and spruce; mainly of the first two species. On the east side of the lake the hemlock is of good quality; that on the west is poor and small. The cedar is of poor quality in all parts of the township, though large east of the lake. The trunks are commonly short and hollow at the base, but can be used for shingles. Spruce is of good quality and very large. It is found mainly on the bottom lands bordering the lake.

The timber can be logged to Ozette Lake, which can be reached by a railroad up Hoko River from the Strait of Juan de Fuca, or it could be milled at the lake and carried out as lumber.

Forest conditions in T. 30 N., R. 15 W.

Timbered area	acres..	14,080
Timbered bottom lands	do...	1,695
Total stand of timber	feet B. M..	591,250,000
Average stand per acre	do...	42,000
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 30 N., R. 15 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	223	109	41	23	9	37	199
Hemlock	278	114	19	21	4	7	145
Spruce	90¼	173	47	46	3	5	177

TOWNSHIP 30 NORTH, RANGE 16 WEST.

This is a fractional township, consisting of parts of the eastern tier of sections along the Pacific coast. The total area of the township does not exceed two sections. Its surface is gently rolling, dropping to the coast by a rocky bluff ranging in height from 60 to 160 feet. The underbrush is dense.

The timber consists of cedar, hemlock, and spruce, and is all of poor quality. It can be logged to the eastward into Ozette Lake.

Forest conditions in T. 30 N., R. 16 W.

Timbered area	acres..	1,280
Total stand of timber	feet B. M..	31,000,000
Average stand per acre	do...	24,200
Depth of humus	inches..	2
Litter		Light.

Statistics of forest trees in T. 30 N., R. 16 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	13¾	92	40	22	8	39	200
Hemlock	9½	103	20	19	5	8	143
Spruce	7¾	163	40	37	2	5	163

TOWNSHIP 31 NORTH, RANGE 14 WEST.

This township is in the northwestern part of the reserve. The northern part of it rises to an altitude of 2,000 feet above sea level, from which the land descends southward to the broad valley of Big River, a tributary of Ozette Lake, and eastward to Hoko River. Most of the area is rolling land, with low ridges. The soil is clay and loam on the bottom lands, while the uplands are also clay, but quite stony in places, especially in the northern part of the township. The underbrush is very dense.

The timber consists of hemlock, cedar, and spruce, with considerable silver fir and a little red fir. The total stand is very heavy, this being one of the most heavily timbered townships of the State. The hemlock is mainly of good quality and with a heavy stand, especially in the northern part of the township. The spruce also is very large and of good quality, being found mainly on the bottom lands in the south half of the township. The cedar timber is large, but of poor quality. It can, however, be used for shingles.

With the exception of a small tract in the northwest corner, the timber in this township can all be logged into Hoko River, which is a good logging stream, with good banks and sufficient water during the winter season for driving. Another outlet is by railroad from the Strait of Juan de Fuca up Hoko River and across a low divide to the valley of Big River. The southern part of the township can be logged very cheaply, but the northern part, being hilly, will be more expensive. It is probable that in this part of the township chutes will have to be employed for the transportation of timber.

Forest conditions in T. 31 N., R. 14 W.

Timbered area	acres..	23,040
Timbered bottom land	do...	3,945
Total stand of timber	feet B. M..	1,171,750,000
Average stand per acre	do...	50,860
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 31 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	31	219	56	71	4	7	230
Cedar	291¾	116	54	30	10	33	219
Hemlock	539	127	26	31	4	9	148
Spruce	181	188	53	63	2	5	198
Lovely fir	129	147	35	40	2	....	159

Township 31 North, Range 15 West.

This full township lies in the northwestern part of the reserve, near the coast. The land rises at the summit to an altitude of over 1,000 feet, from which it descends on all sides and is drained by several small streams to the Pacific Ocean and to Ozette Lake to the south. In the southern part is considerable bottom and swamp land.

The underbrush is very dense, being made up of a great variety of plants.

The entire area, with the exception of a few acres burned, is timbered with a heavy stand, consisting mainly of cedar and hemlock, with some spruce and a little lovely fir. The cedar is very large, but of poor quality, and makes a heavy stand in the southern part of the township. The hemlock, which is mainly in the northern part of the township, is of good quality. The spruce timber is very large and excellent. It has a heavy stand on the bottom lands in the southern part of the township.

The timber in the northern part of this township will have to be logged to Ozette River; that in the southern part of it to Ozette Lake, or by railroad from Hoko River through a low divide. It can be logged very easily and cheaply.

Forest conditions in T. 31 N., R. 15 W.

Timbered area	acres..	23,040
Burned area	do...	60
Timbered bottom land	do...	2,800
Total stand of timber	feet B. M..	982,000,000
Average stand per acre	do...	42,600
Depth of humus	inches..	4
Litter		Heavy.

Statistics of forest trees in T. 31 N., R. 15 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	370½	111	48	30	10	35	219
Hemlock	429	122	23	26	5	8	144
Spruce	128	184	49	54	3	5	195
Lovely fir	54½	149	33	38	2	5	159

Township 31 North, Range 16 West.

This is a fractional township upon the Pacific coast, consisting of secs. 24, 25, and 36 and fractional secs. 1, 12, 13, 23, 26, and 35, together with Flattery Rocks, in sec. 21, and Ozette Island, in secs. 28 and 33. The township includes Ozette Indian Reservation, which comprises parts of secs. 23, 24, 25, and 26.

The surface is mainly a gentle slope toward the sea, dropping off on the coast line by a steep, rocky bluff ranging in height from 100 to 200 feet. The underbrush is very dense.

The timber consists of cedar, hemlock, and spruce, all of poor quality. It can all be logged to Ozette River, which flows through the township and is a good logging stream. There is, however, no harbor at its mouth; consequently it will be necessary to manufacture the timber on the spot or ship it out by railroad.

Forest conditions in T. 31 N., R. 16 W.

Timbered area	acres	3,520
Burned area	do	55
Total stand of timber	feet B. M.	96,750,000
Average stand per acre	do	27,500
Depth of humus	inches	3
Litter		Medium.

Statistics of forest trees in T. 31 N., R. 16 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	53½	101	34	19	10	40	208
Hemlock	26½	98	18	20	6	10	141
Spruce	16¾	160	39	38	2	4	178

TOWNSHIP 32 NORTH, RANGE 14 WEST.

This township, in the northwestern part of the reserve, has a broken, hilly surface drained to the eastward by Sekiu River. In the northern part of the township the land rises to an altitude of 1,000 feet, and in the southern part to a height of 1,800 feet. The soil is red clay and sandy, and stony on the divides and on the banks of the creeks. The underbrush is very dense.

The timber can all be logged to the Sekiu River, with the exception of that in a small tract in the southwest corner of the township, which can be logged down the Suez. Sekiu River is a poor logging stream, not having sufficient water for driving large logs, although shingle bolts can be driven during the winter season. The valley along the river affords a good route for a railroad, which can be built very cheaply into this township.

This is the most heavily timbered township in the reserve, and one of the most heavily timbered in the State of Washington. The timber consists chiefly of hemlock and lovely fir, of large size and excellent quality. The cedar timber, though large, is poor. Spruce is very scattering, being found only on the creeks and along the Sekiu River. Fir timber is limited to a small area, most of it being in the northeast corner of the township.

Forest conditions in T. 32 N., R. 14 W.

Timbered area	acres	23,040
Total stand of timber	feet B. M.	1,360,000,000
Average stand per acre	do	59,000
Depth of humus	inches	3
Litter		Medium.

Statistics of forest trees in T. 32 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	37¾	205	45	50	4	7	218
Cedar	286½	119	50	30	9	28	220
Hemlock	669	134	28	33	4	7	152
Spruce	34¾	187	41	53	2	4	195
Lovely fir	332	155	33	42	3	5	163

TOWNSHIP 32 NORTH, RANGE 15 WEST.

This is a fractional township, consisting of secs. 19 to 36, inclusive, and the south half of secs. 13 to 18, the remainder of the township being included in the Makah Indian Reservation. Secs. 18 and 19 are fractional, as they extend to the Pacific Ocean.

The surface is very steep and broken in the northeast and southeast corners. The balance of the area is rolling, with level bottom land along the Suez River. The soil is a clayey loam on the bottom lands, with red clay and sand on the uplands. The underbrush is very dense.

The timber on this township can all be logged to the Suez River. This has good banks and sufficient water in the winter season for driving logs, but as there is no harbor south of Cape Flattery on this coast it will be necessary to build a road of some kind from Neah Bay to the mouth of Suez River.

The hemlock and cedar timber in the east and south parts of this township are of good quality, but on the west they are very small and poor. The spruce timber is large and of good quality. It is found along the rivers and in the bottom lands.

Forest conditions in T. 32 N., R. 15 W.

Timbered area	acres	12,800
Timbered bottom lands	do	1,195
Total stand of timber	feet B. M.	579,000,000
Average stand per acre	do	45,000
Depth of humus	inches	4
Litter		Light.

Statistics of forest trees in T. 32 N., R. 15 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	221	107	42	24	10	30	210
Hemlock	241½	117	21	26	4	8	141
Spruce	78½	175	45	50	2	5	191
Lovely fir	38	150	32	41	2	4	161

TOWNSHIP 32 NORTH, RANGE 16 WEST.

This is a small fraction of a township, comprising parts of secs. 25 and 26 only, with a total area of less than one square mile, immediately on the Pacific coast. The surface is steep and rolling, with a sharp bluff on the coast line. The underbrush is very dense. The timber consists mainly of cedar, very large and of poor quality. It can be gotten out easily to the coast.

Forest conditions in T. 32 N., R. 16 W.

Timbered area	acres..	640
Total stand of timber	feet B. M..	16,500,000
Average stand per acre	do...	25,800

Statistics of forest trees in T. 32 N., R. 16 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Cedar	10	105	48	24	10	40	210
Hemlock	5	100	17	22	9	12	130
Spruce	1½	160	40	44	2	6	180

TOWNSHIP 33 NORTH, RANGE 14 WEST.

This is a fractional township, bordering on the Strait of Juan de Fuca. It comprises secs. 19 and 28 to 35, together with fractional secs. 17, 18, 20, 21, 22, 26, 27, and 36, with a total area of approximately 14 square miles. The surface is steep and broken with many canyons, the land rising to a height of 1,060 feet. The soil is clay or sand. The underbrush is very dense everywhere.

The timber on this township can all be logged to the strait very cheaply by means of roads built up the creeks, but as there are no good harbors along this part of the coast it will be necessary to make small booms of the logs and tow them to some safe harbor up the coast.

The timber is chiefly hemlock and lovely fir of good quality. The cedar though large is of inferior quality. The spruce timber, found merely along the strait, is excellent. The fir timber is found mainly in the southern part and is of excellent quality.

Forest conditions in T. 33 N., R. 14 W.

Timbered area	acres..	8,960
Total stand of timber	feet B. M..	395,750,000
Average stand per acre	do...	44,200
Depth of humus	inches..	3
Litter		Medium.

Statistics of forest trees in T. 33 N., R. 14 W.

Species.	Stand.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Million ft. B. M.	*Feet.*	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	7½	213	47	49	4	6	225
Cedar	20¾	115	48	30	9	28	218
Hemlock	236	138	29	33	4	8	155
Spruce	32	196	53	55	3	5	212
Lovely fir	99½	154	34	41	3	6	167

SUMMARIES.

The following table summarizes the classification of lands by townships:

Classification of lands in Olympic Forest Reserve.

Township.	Range.	Timbered area.	Burned area.	Cut area.	Timberless area.	Barren area.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
21 north	5 west	16,920	4,480	1,640	....	....
21 north	6 west	15,600	....	7,440	....	....
21 north	7 west	23,000	50	....	....	....
21 north	8 west	23,040	....	....	....	....
21 north	9 west	21,809	200	1,031	....	....
21 north	10 west	22,560	480	....	....	....
21 north	11 west	7,095	....	....	....	....
22 north	5 west	22,080	960	....	....	....
22 north	6 west	23,040	....	....	....	....
22 north	7 west	22,425	615	....	....	....
22 north	8 west	22,940	100	....	....	....
22 north	9 west	22,870	170	....	....	....
22 north	10 west	10,260	1,240	....	....	....
23 north	5 west	19,105	2,560	....	735	640
23 north	6 west	20,736	192	....	448	1,664

Classification of lands in Olympic Forest Reserve—Continued.

Township.	Range.	Timbered area.	Burned area.	Cut area.	Timberless area.	Barren area.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
23 north	7 west	19,900	....	....	1,860	1,280
23 north	8 west	23,040	....	....	....	....
23 north	9 west	22,955	85	....	....	....
23 north	10 west	10,200	380	....	....	....
23 north	11 west	3,650	....	....	....	....
24 north	4 west	21,917	213	....	....	550
24 north	5 west	17,600	640	....	....	1,600
24 north	6 west	17,920	....	....	4,480	640
24 north	7 west	19,965	35	....	2,560	480
24 north	8 west	20,907	320	....	1,493	320
24 north	9 west	15,200	640	....	7,200	....
24 north	10 west	22,900	140	....	....	....
24 north	11 west	20,780	2,260	....	....	....
24 north	12 west	19,736	124	....	....	....
24 north	13 west	8,280	....	....	....	....
25 north	3 west	19,182	....	178	3,680	....
25 north	4 west	16,622	178	....	4,480	1,760
25 north	5 west	12,480	....	....	4,800	5,760
25 north	6 west	16,547	....	....	4,680	1,830
25 north	7 west	16,440	....	....	4,680	1,920
25 north	8 west	17,601	....	....	4,586	853
25 north	9 west	24,876	....	....	2,964	....
25 north	10 west	23,040	....	....	....	....
25 north	11 west	23,040	....	....	....	....
25 north	12 west	23,040	....	....	....	....
25 north	13 west	15,120	....	....	....	....
26 north	3 west	17,780	1,680	....	1,920	1,660
26 north	4 west	16,960	....	....	3,520	2,560
26 north	5 west	9,950	....	....	7,040	6,050
26 north	6 west	14,686	....	....	4,408	3,946
26 north	7 west	14,080	....	....	4,480	4,480
26 north	8 west	3,760	....	....	16,720	2,560
26 north	9 west	19,520	....	....	7,536	728
26 north	10 west	23,040	....	....	....	....
26 north	11 west	22,720	320	....	....	....
26 north	12 west	23,040	....	....	....	....
26 north	13 west	21,440	....	....	....	....
26 north	14 west	2,560	....	....	....	....
27 north	3 west	16,000	2,445	....	2,880	1,280
27 north	4 west	11,200	....	....	7,040	5,440
27 north	5 west	2,560	....	....	7,680	5,760

Classification of lands in Olympic Forest Reserve—Continued.

Township.	Range.	Timbered area.	Burned area.	Cut area.	Timberless area.	Barren area.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
27 north	6 west	18,880	1,280	....	1,600	1,280
27 north	7 west	14,720	....	....	2,800	5,440
27 north	8 west	6,080	....	....	3,520	13,440
27 north	9 west	10,560	....	....	7,916	9,364
27 north	10 west	22,685	....	....	355	....
27 north	11 west	23,040	....	....	....	....
27 north	12 west	23,040	....	....	....	....
27 north	13 west	23,040	....	....	....	....
27 north	14 west	15,680	....	....	....	....
27 north	15 west	600	....	....	....	....
28 north	3 west	16,420	5,970	....	640	640
28 north	4 west	13,120	3,200	....	2,880	3,840
28 north	5 west	17,000	640	....	4,480	1,920
28 north	6 west	13,760	3,840	....	4,480	960
28 north	7 west	16,000	3,840	....	1,920	1,280
28 north	8 west	15,552	128	....	4,960	2,400
28 north	9 west	25,778	192	....	1,742	128
28 north	10 west	23,040	....	....	....	....
28 north	11 west	23,040	....	....	....	....
28 north	12 west	23,040	....	....	....	....
28 north	13 west	21,580	....	....	1,460	....
28 north	14 west	21,370	....	....	1,670	....
28 north	15 west	13,765	....	....	235	....
29 north	3 west	15,150	6,890	....	....	....
29 north	4 west	9,280	13,440	....	320	....
29 north	5 west	15,360	7,040	....	640	640
29 north	6 west	13,749	3,435	....	4,960	896
29 north	7 west	20,900	980	....	1,100	64
29 north	8 west	20,480	....	....	1,920	640
29 north	9 west	27,200	....	....	640	....
29 north	10 west	23,040	....	....	....	....
29 north	11 west	22,440	600	....	....	....
29 north	12 west	22,240	800	....	....	....
29 north	13 west	21,960	800	....	280	....
29 north	14 west	23,000	....	....	....	....
29 north	15 west	19,200	....	....	....	....
30 north	9 west	22,336	1,115	....	....	....
30 north	10 west	8,685	14,355	....	....	....
30 north	11 west	7,935	15,105	....	....	....
30 north	12 west	17,165	5,750	....	125	....
30 north	13 west	21,760	3,150	....	410	....

Classification of lands in Olympic Forest Reserve—Continued.

Township.	Range.	Timbered area.	Burned area.	Cut area.	Timberless area.	Barren area.
		Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*
30 north	14 west	16,000	160			
30 north	15 west	14,080				
30 north	16 west	1,280				
31 north	14 west	23,040				
31 north	15 west	23,040	60			
31 north	16 west	3,520	55			
32 north	14 west	23,040				
32 north	15 west	12,800				
32 north	16 west	640				
33 north	14 west	8,960				
Total		1,845,984	113,332	10,289	162,923	96,693

The following table summarizes the stand of timber, by total stand and by species, in each township:

Stand and classification of timber in Olympic Forest Reserve.

Township.	Range.	Total stand.	Average stand.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir
		M feet B. M.	*Feet B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*
21 north	5 west	814,250	48,100	742	11	61¼		
21 north	6 west	749,500	48,000	531	39	179½		
21 north	7 west	1,211,750	52,600	747	121¾	324	3	16
21 north	8 west	1,165,500	50,600	792½	68	253		52
21 north	9 west	1,159,250	53,100	741½	36½	313	49¾	18½
21 north	10 west	1,058,500	47,000	446	226	336	50½	
21 north	11 west	253,250	35,700	19½	145½	77	11¼	
22 north	5 west	768,750	34,800	672½	23¾	70½		2
22 north	6 west	631,250	27,400	355½	32¾	224		19
22 north	7 west	1,022,500	45,600	430	101	364		127½
22 north	8 west	1,077,500	46,900	133	65½	528		351
22 north	9 west	926,500	40,300	17½	152	475	22	260
22 north	10 west	429,000	42,000	58½	119	215¾	35¾	
23 north	5 west	542,250	28,400	287¾	71¾	116½		66¼
23 north	6 west	383,500	18,500	161	42¼	96¼		84
23 north	7 west	369,750	19,000	53	36¾	167½		112½
23 north	8 west	481,500	20,900		38	233½		210
23 north	9 west	590,500	25,600	119¼	52	334¾	18½	66
23 north	10 west	457,000	45,000	40	16¼	240¾	28	132
23 north	11 west	179,250	49,000		14¼	97		68

Stand and classification of timber in Olympic Forest Reserve—Continued.

Township.	Range.	Total stand.	Acreage stand.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
		M feet B. M.	*Feet B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*
24 north........	4 west.......	566, 750	25, 800	306¼	62½	167	....	31
24 north........	5 west.......	485, 500	27, 600	137¼	76½	140¾	1¾	129¼
24 north........	6 west.......	359, 250	20, 000	59¼	55¾	113½	6¼	124½
24 north........	7 west.......	358, 500	18, 000	27	29¾	184¾	....	117
24 north........	8 west.......	748, 250	36, 000	187½	75¼	321	42	122½
24 north........	9 west.......	539, 750	34, 200	13	28¼	246½	8	244
24 north........	10 west......	910, 750	40, 000	6¼	62½	459	12	371
24 north........	11 west......	788, 250	37, 500	7½	160¾	355	37	228
24 north........	12 west......	505, 500	25, 000	2	166	221	56	60½
24 north........	13 west......	240, 000	29, 000	....	84	135	14	7
25 north........	3 west.......	604, 000	31, 000	458¼	34¾	102½	....	8½
25 north........	4 west.......	340, 000	20, 400	171	6½	91	....	71½
25 north........	5 west.......	206, 000	16, 500	30¾	16¼	72	½	86½
25 north........	6 west.......	196, 750	12, 000	11¼	9½	92	....	84
25 north........	7 west.......	399, 750	24, 300	8½	31¼	206	....	154
25 north........	8 west.......	444, 000	25, 200	½	32½	220	....	191
25 north........	9 west.......	881, 500	35, 400	112	75	402	82½	210
25 north........	10 west......	1, 001, 250	43, 500	31½	65½	466	64¼	374
25 north........	11 west......	860, 750	37, 400	....	61½	482	24¼	293
25 north........	12 west......	676, 750	29, 400	¼	38½	438	73	127
25 north........	13 west......	533, 500	35, 300	....	218	287	27	1½
26 north........	3 west.......	606, 000	34, 100	332	11	225	....	38
26 north........	4 west.......	516, 000	30, 400	119	13½	186	....	197½
26 north........	5 west.......	101, 750	12, 300	15½	3¼	38	....	45
26 north........	6 west.......	296, 000	20, 100	64	5	101	....	126
26 north........	7 west..... .	177, 250	12, 600	19½	....	61¾	....	96
26 north........	8 west.......	111, 250	28, 200	....	7¼	55½	....	48½
26 north........	9 west.......	671, 250	34, 400	8½	46¾	305	....	311
26 north........	10 west......	1, 051, 000	45, 400	15½	43	476	8½	508
26 north........	11 west......	937, 250	41, 200	9½	88½	459	24¾	355½
26 north........	12 west......	682, 500	29, 600	....	106½	429	42¼	104¾
26 north........	13 west......	697, 000	32, 500	....	197½	372	91½	36
26 north........	14 west......	93, 000	36, 300	....	21	60	12	....
27 north........	3 west.......	511, 500	32, 000	167½	8	240¾	....	95¼
27 north........	4 west.......	33, 500	3, 000	1½	....	12¾	....	19¼
27 north........	5 west.......	35, 750	14, 000	1½	....	14¼	....	20
27 north........	6 west.......	425, 000	22, 500	155½	....	146	....	123½
27 north........	7 west.......	49, 250	3, 300	8	....	17	....	24¼
27 north........	8 west.......	67, 000	11, 000	25	....	18¾	....	23¼
27 north........	9 west.......	273, 000	25, 800	45	16	129	....	83

Stand and classification of timber in Olympic Forest Reserve—Continued.

Township.	Range.	Total stand.	Average stand.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
		M feet B. M.	*Feet B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*
27 north	10 west	994,250	43,800	295	6¾	386	60½	246
27 north	11 west	843,000	36,200	134	36½	383	64¼	225¼
27 north	12 west	738,000	32,000	32	146½	413	37½	109
27 north	13 west	1,015,500	44,100	....	306	493	65	151½
27 north	14 west	634,750	40,500	....	83	464	87¾	....
27 north	15 west	13,750	22,900	....	¾	12	1	....
28 north	3 west	641,250	39,000	155	32¼	266	....	188
28 north	4 west	50,500	4,000	....	....	19	....	31½
28 north	5 west	83,500	4,900	....	....	30	....	53½
28 north	6 west	143,000	10,900	49	....	52	....	42
28 north	7 west	177,500	11,100	59½	....	71	....	47
28 north	8 west	207,750	13,400	112	4	53¼	....	38½
28 north	9 west	266,750	10,300	18	1	137¾	....	110
28 north	10 west	539,500	23,400	40½	....	262	7	230
28 north	11 west	811,500	35,300	140	10½	428	27	206
28 north	12 west	1,050,500	45,600	98	27	555	43½	327
28 north	13 west	951,500	44,100	131	31½	512	152	125
28 north	14 west	722,000	33,800	50	14½	350½	307	....
28 north	15 west	318,500	23,100	....	14	251	53½	....
29 north	3 west	739,250	48,700	506	24¾	208½	....	....
29 north	4 west	217,750	23,400	132¾	72¾	12¼	....	....
29 north	5 west	360,250	23,500	169	20¼	119	....	52
29 north	6 west	•265,000	19,000	107	5½	93	....	59½
29 north	7 west	196,500	9,400	109	9	69½	....	9
29 north	8 west	288,500	14,100	18½	....	117½	....	152½
29 north	9 west	555,000	20,400	306½	1½	165	3	79
29 north	10 west	862,000	37,400	345	4	418	2	93
29 north	11 west	889,250	39,600	255½	8	456	9¾	160
29 north	12 west	1,152,500	51,800	387	22½	519	99	125
29 north	13 west	1,086,000	49,500	384	4	454	196½	47½
29 north	14 west	788,000	34,300	19	78½	471½	219	....
29 north	15 west	744,750	38,800	....	228¾	367	149	....
30 north	9 west	876,250	40,000	549¾	48½	203½	16½	58
30 north	10 west	397,500	45,800	228	9	160½	....	....
30 north	11 west	375,250	47,400	216	19¼	104	22	14
30 north	12 west	746,000	43,400	413	15½	191½	84	42
30 north	13 west	894,750	41,100	74½	42¾	394½	236½	146½
30 north	14 west	883,500	55,200	6	200	485	132½	60
30 north	15 west	591,250	42,000	....	223	278	90¼	....
30 north	16 west	31,000	24,200	....	13¾	9½	7¾	....

Stand and classification of timber in Olympic Forest Reserve—Continued.

Township.	Range.	Total stand.	Average stand.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
		M feet B. M.	*Feet. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*	*Million ft. B. M.*
31 north	14 west	1,171,750	50,860	31	291¾	539	181	129
31 north	15 west	982,000	42,600	....	370½	429	128	54½
31 north	16 west	96,750	27,500	....	53½	26½	16¾	....
32 north	14 west	1,360,000	59,000	37¾	286½	669	34¾	332
32 north	15 west	579,000	45,000	....	221	241½	78½	38
32 north	16 west	16,500	25,800	....	10	5	1½	....
33 north	14 west	395,750	44,200	7½	20¾	236	32	99½
Total		60,998,250	33,000	14,521¾	6,390¼	25,837¼	3,492½	10,756½

The following table summarizes for the entire area examined the characteristics and condition of the several species of timber trees.

Average statistics of forest trees in Olympic Forest Reserve.

Species.	Height.	Diameter.	Clear.	Dead.	Diseased.	Age.
	Feet.	*Inches.*	*Feet.*	*Per cent.*	*Per cent.*	*Years.*
Red fir	176	37	41	6	8	200
Cedar	106	34	21	10	24	185
Hemlock	117	20	21	7	12	139
Spruce	187	48	49	4	5	190
Lovely fir	122	23	26	5	13	143

It is to be noted that the Sitka spruce is the largest tree upon the peninsula, both in height and diameter, and that its proportion of dead and deceased is the smallest. Next to this species comes the red fir, while the cedar is a comparatively small tree and has a high percentage of dead and diseased individuals.

Percentages of species in Olympic Forest Reserve, by townships.

Township.	Range.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
21 north	5 west	91	1	8	....	....
21 north	6 west	71	5	24	....	....
21 north	7 west	62	10	27	....	1
21 north	8 west	68	6	22	....	4
21 north	9 west	65	3	27	4	1
21 north	10 west	42	21	32	5	....
21 north	11 west	8	58	30	4	....
22 north	5 west	88	3	9	....	....

Percentages of species in Olympic Forest Reserve, by townships—Continued.

Township.	Range.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
22 north	6 west	56	5	36	....	3
22 north	7 west	42	9	36	....	13
22 north	8 west	12	6	49	....	33
22 north	9 west	2	17	51	2	28
22 north	10 west	13	27	52	8	....
23 north	5 west	53	13	21	....	13
23 north	6 west	42	11	25	....	22
23 north	7 west	14	10	45	....	31
23 north	8 west	....	8	48	....	44
23 north	9 west	20	9	57	3	11
23 north	10 west	9	3	53	6	29
23 north	11 west	....	8	54	....	38
24 north	4 west	54	11	30	....	5
24 north	5 west	28	16	29	....	27
24 north	6 west	16	15	32	2	35
24 north	7 west	7	8	52	....	33
24 north	8 west	25	10	43	6	16
24 north	9 west	2	5	46	2	45
24 north	10 west	....	7	50	2	41
24 north	11 west	1	20	45	5	29
24 north	12 west	....	33	44	11	12
24 north	13 west	....	35	56	6	3
25 north	3 west	76	6	17	....	1
25 north	4 west	50	2	27	....	21
25 north	5 west	15	8	35	....	42
25 north	6 west	6	5	46	....	43
25 north	7 west	2	8	52	....	38
25 north	8 west	....	8	49	....	43
25 north	9 west	13	8	46	9	24
25 north	10 west	3	7	47	6	37
25 north	11 west	....	7	56	3	34
25 north	12 west	....	5	65	11	19
25 north	13 west	....	41	54	5	....
26 north	3 west	55	2	37	....	6
26 north	4 west	23	3	36	....	38
26 north	5 west	15	3	37	....	44
26 north	6 west	22	2	34	....	42
26 north	7 west	11	....	35	....	54
26 north	8 west	....	6	50	....	44
26 north	9 west	1	7	46	....	46
26 north	10 west	1	4	45	1	49
26 north	11 west	1	9	49	3	38

Percentages of species in Olympic Forest Reserve, by townships—Continued.

Township.	Range.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
26 north	12 west	....	16	63	6	15
26 north	13 west	....	28	53	13	6
26 north	14 west	....	23	64	13	....
27 north	3 west	33	2	47	....	18
27 north	4 west	4	....	38	....	58
27 north	5 west	4	....	40	....	56
27 north	6 west	37	....	34	....	29
27 north	7 west	16	....	35	....	49
27 north	8 west	37	....	28	....	35
27 north	9 west	16	6	48	....	30
27 north	10 west	30	1	39	6	24
27 north	11 west	16	4	46	7	26
27 north	12 west	4	20	56	5	15
27 north	13 west	....	30	49	6	15
27 north	14 west	....	13	73	14	....
27 north	15 west	....	5	88	7	....
28 north	3 west	24	5	41	30	....
28 north	4 west	....	....	38	62	....
28 north	5 west	....	....	36	64	....
28 north	6 west	34	....	36	30	....
28 north	7 west	33	....	40	....	27
28 north	8 west	54	2	26	....	18
28 north	9 west	7	....	52	....	41
28 north	10 west	7	....	49	1	43
28 north	11 west	17	1	53	3	26
28 north	12 west	9	3	53	4	31
28 north	13 west	14	3	54	16	13
28 north	14 west	7	2	48	43	....
28 north	15 west	....	4	79	17	....
29 north	3 west	69	3	28	....	....
29 north	4 west	61	33	6	....	....
29 north	5 west	47	6	33	....	14
29 north	6 west	40	2	35	....	23
29 north	7 west	55	5	35	....	5
29 north	8 west	6	....	41	....	53
29 north	9 west	55	....	30	1	14
29 north	10 west	40	....	49	....	11
29 north	11 west	29	1	51	1	18
29 north	12 west	33	2	45	9	11
29 north	13 west	35	....	42	18	5
29 north	14 west	2	10	60	28	....
29 north	15 west	....	31	49	20	....

Percentages of species in Olympic Forest Reserve, by townships—Continued.

Township.	Range.	Red fir.	Cedar.	Hemlock.	Spruce.	Lovely fir.
30 north	9 west	63	5	23	2	7
30 north	10 west	57	2	41	....	....
30 north	11 west	58	5	28	6	3
30 north	12 west	56	2	26	11	5
30 north	13 west	8	5	44	27	16
30 north	14 west	1	22	55	15	7
30 north	15 west	....	38	47	15	....
30 north	16 west	....	44	31	25	....
31 north	14 west	3	25	46	15	11
31 north	15 west	....	37	45	13	5
31 north	16 west	....	55	28	17	....
32 north	14 west	3	21	49	3	24
32 north	15 west	....	38	42	13	7
32 north	16 west	....	61	30	9	....
33 north	14 west	2	5	60	8	25

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